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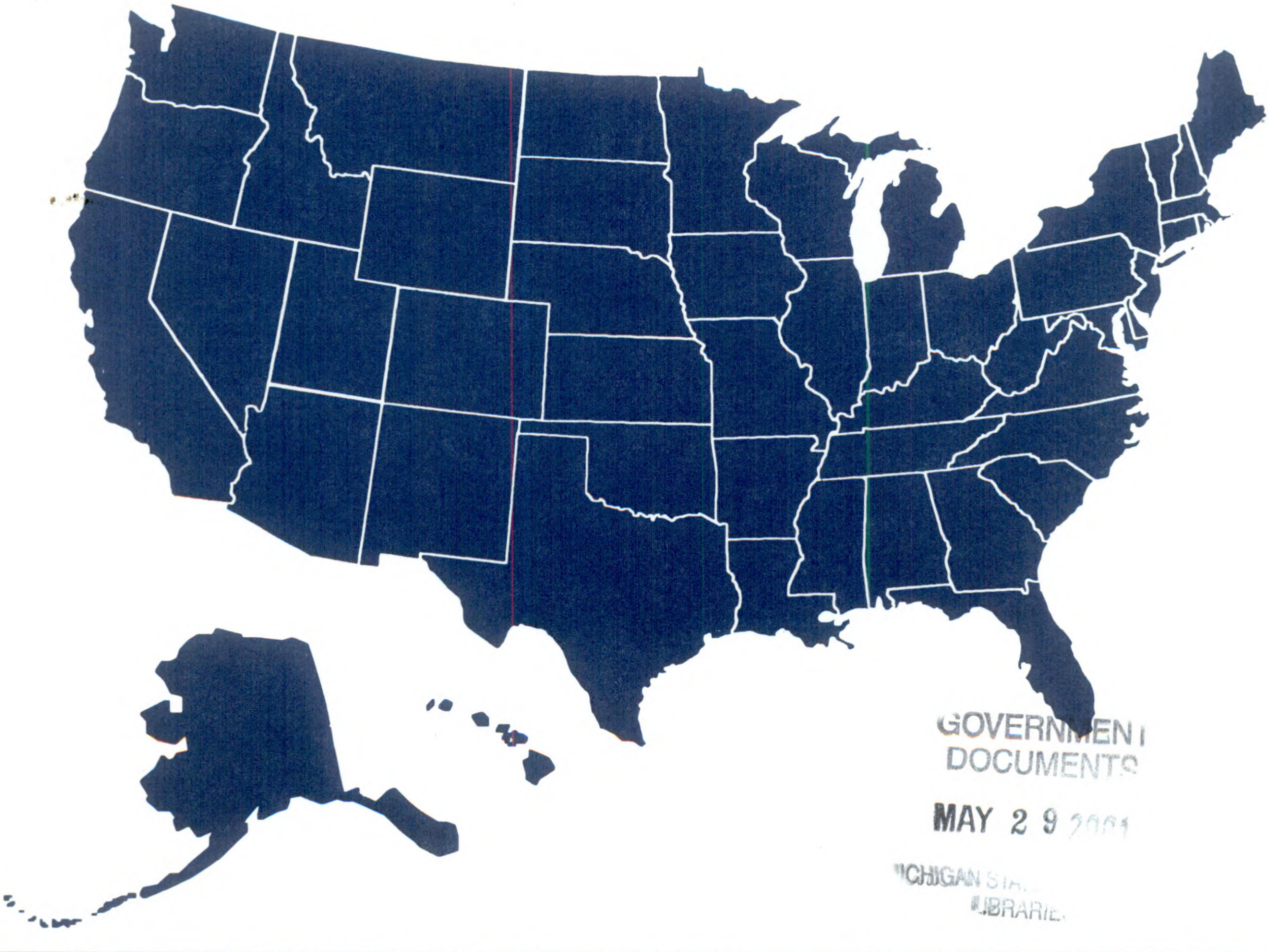
MINERALS YEARBOOK

Area Reports: Domestic 1999

Volume II



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MINERALS YEARBOOK

Area Reports: Domestic 1999

Volume II

U.S. DEPARTMENT OF THE INTERIOR
GALE A. NORTON, Secretary

U.S. GEOLOGICAL SURVEY
CHARLES G. GROAT, Director

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Foreword

This edition of the U.S. Geological Survey (USGS) Minerals Yearbook discusses the performance of the worldwide minerals and materials industry during 1999 and provides background information to assist in interpreting that performance. Content of the individual Minerals Yearbook volumes follows:

- Volume I, Metals and Minerals, contains chapters about virtually all metallic and industrial mineral commodities important to the U.S. economy. Chapters on survey methods, summary statistics for domestic nonfuel minerals, and trends in mining and quarrying in the metals and industrial mineral industries in the United States are also included.
- Volume II, Area Reports: Domestic, contains a chapter on the mineral industry of each of the 50 States and Puerto Rico and the Administered Islands. This volume also has chapters on survey methods and summary statistics of domestic nonfuel minerals.
- Volume III, Area Reports: International, is published as four separate reports. These regional reports contain the latest available minerals data on more than 190 foreign countries and discuss the importance of minerals to the economies of these nations and the United States. Each report begins with an overview of the region's mineral industries during the year. It continues with individual country chapters that examine the mining, refining, processing, and use of minerals in each country of the region and how each country's mineral industry relates to U.S. industry. Most chapters include production tables and industry structure tables, information about Government policies and programs that affect the country's mineral industry, and an outlook section.

The USGS continually strives to improve the value of its publications to users. Constructive comments and suggestions by readers of the Minerals Yearbook are welcomed.

Charles G. Groat
Director

Contacts

Information about the U.S. Geological Survey, its programs, staff, and products may be accessed on the World Wide Web at URL http://www.usgs.gov/ or by contacting the Earth Science Information Center at 1-888-ASK-USGS. For specific information about this publication, contact the Chief, Publication Services Section, Minerals Information Team, at (703) 648-4750. Additional minerals information may be accessed on the World Wide Web at URL http://minerals.usgs.gov/minerals/.

Acknowledgments

The volume was produced by Arnold Tanner and Roger Loebenstein, both Physical Scientists with the Minerals Information Team of the U.S. Geological Survey (USGS). Domestic nonfuel raw mineral production data and tables were prepared by Stephen Smith, Industry Data Analyst; crushed stone data and tables were prepared by Susan Copeland, Statistical Assistant; and construction sand and gravel data and tables were prepared by Cheryl Crawford, Statistical Assistant. All mineral commodity rankings and statistical analyses were performed by Mr. Tanner and were based on data reported to the USGS by companies responding to the annual canvasses of nonfuel mineral producers in the United States. Mineral production data and related rankings for 1999 are preliminary owing to publication of this volume before final data for all mineral commodities were available. Data and related rankings prior to 1999 are from final tabulations. For crushed stone and construction sand and gravel, each State chapter includes tabular data by State aggregate districts, where applicable, based on final 1998 data. Compilations of data contained in this volume were largely based on statistics and other data provided by the mineral industries. The USGS gratefully acknowledges the willing contribution of these essential data by both companies and individuals. Information regarding a State's mining industry, mineral exploration, and other mining-related activities or legislation was derived from information submitted by officials from each participating State. We thank those State agencies that contributed mining and minerals industry information for their States. Their submissions significantly broadened the scope of those chapters; their participation in this joint project is greatly appreciated. Authors of text submissions from participating States are referenced by footnote in each chapter as appropriate. All chapters underwent technical review by USGS mineral commodity specialists and other agency professionals. The melding of their knowledge and expertise into this project was invaluable in producing accurate individual documents and is greatly appreciated. Each of these State chapters was published previously as a State Annual Estimate in the USGS "Mineral Industry Surveys" series. Maps indicating "major producing areas" lead off each respective chapter. A new chapter describes the meaning of and lists the mineral symbols used in this volume. The State maps were updated and revised in collaboration with USGS commodity specialists and State Geologists.

In the collection of statistical and other mineral industry information, the USGS also was assisted by various State agencies through cooperative memoranda of understanding (MOU's). Some of the chapters in this publication were reviewed by staff members of these State agencies. Our sincere appreciation for all agency cooperation is extended to the State and Commonwealth government agencies which have MOU's with the USGS. These are as follows:

Alabama: Geological Survey of Alabama.
Arizona: Arizona Department of Mines and Mineral Resources.
Arkansas: Arkansas Geological Commission.
California: California Department of Conservation, Division of Mines and Geology.
Colorado: Colorado Geological Survey.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Florida Geological Survey.
Georgia: Georgia Geologic Survey.
Idaho: Idaho Geological Survey.
Illinois: Illinois State Geological Survey.
Indiana: Indiana Geological Survey.
Iowa: Iowa Geological Survey Bureau.
Kansas: Kansas Geological Survey.
Kentucky: Kentucky Geological Survey.
Louisiana: Louisiana Geological Survey.
Maine: Maine Geological Survey.
Maryland: Maryland Department of the Environment, Minerals, Oil, and Gas Division.
Massachusetts: Massachusetts Executive Office of Environmental Affairs.
Michigan: Michigan Department of Environmental Quality, Geologic Survey Division.
Mississippi: Mississippi Department of Environmental Quality, Office of Geology.
Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey.
Montana: Montana Bureau of Mines and Geology.
Nebraska: University of Nebraska-Lincoln, Nebraska Geological Survey.
Nevada: Nevada Bureau of Mines and Geology.
New Hampshire: New Hampshire Department of Environmental Services.
New Jersey: New Jersey Geological Survey.
New Mexico: New Mexico Bureau of Mines and Mineral Resources.

New York: New York State Geological Survey.
North Carolina: North Carolina Geological Survey.
North Dakota: North Dakota Geological Survey.
Ohio: Ohio Department of Natural Resources, Division of Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey.
Puerto Rico: Department of Natural Resources, Bureau of Geology.
Rhode Island: University of Rhode Island Department of Geology, Office of the State Geologist.
South Carolina: South Carolina Geological Survey.
South Dakota: South Dakota Geological Survey.
Tennessee: Tennessee Department of Environment and Conservation, Division of Geology.
Texas: The University of Texas at Austin, Bureau of Economic Geology.
Utah: Utah Geological Survey.
Vermont: Vermont Geological Survey.
Virginia: Virginia Department of Mines, Minerals and Energy.
Washington: Washington State Department of Natural Resources, Division of Geology and Earth Resources.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Wisconsin Geological and Natural History Survey.
Wyoming: Wyoming State Geological Survey.

John H. DeYoung, Jr.
Chief Scientist, Minerals Information Team

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SURVEY METHODS FOR NONFUEL MINERALS

By Kenneth W. Mlynarski

The U.S. Geological Survey (USGS) collects worldwide data on virtually every commercially important nonfuel mineral commodity. These data form the base for tracking and assessing the health of the minerals sector of the U.S. economy.

The USGS data collection activity was instituted by the 47th Congress in the appropriations act of August 7, 1882 (22 Stat. 329), which placed the collection of mineral statistics on an annual basis. The most recent authority for the USGS survey activity is the National Materials and Minerals Policy, Research and Development Act of 1980 (Public Law 96-479, 96th Congress). This Act strengthens protection for proprietary data provided to the U.S. Department of the Interior by persons or firms engaged in any phase of mineral or mineral-material production or consumption.

Data Collection Surveys

The USGS begins the collection of domestic nonfuel minerals and materials statistics by appraising the information requirements of Government and private organizations of the United States. Requirements that can be met by collecting data from minerals establishments are posed as questions on USGS surveys. Figure 1 shows a typical survey form.

Specific questions about mineral commodity activities, such as production, consumption, and shipments, are structured in the survey forms to provide meaningful aggregated data. Thus, the entire mineral economic cycle from production through consumption is covered by 140 monthly, quarterly, semiannual, and annual surveys.

After the survey form has been designed, a list of the appropriate establishments to be canvassed is developed. Many sources are used to determine which companies, mines, plants, and other operations should be included on the survey mailing list. State geologists, Federal organizations (e.g., Mine Safety and Health Administration), trade associations, industry representatives, and trade publications and directories are some of the sources that are used to develop and update survey listings. With few exceptions, a complete canvass of the list of establishments is used rather than a sample survey. The iron and steel scrap industry is one of the exceptions where a sample survey is conducted.

The Paperwork Reduction Act requires that any Government agency wanting to collect information from 10 or more individuals or establishments must first obtain approval from the Office of Management and Budget (OMB). OMB approves the need to collect the data and protects industry from unwarranted Government paperwork.

Survey Processing

The USGS surveys approximately 18,000 establishments. Each year, the USGS mails about 40,000 forms for 140 different surveys. Each completed survey form returned to the USGS undergoes extensive analysis to ensure the highest possible accuracy of the mineral data. The statistical staff monitors all surveys to ensure that errors are not created by reporting in physical units different from the units requested on the form. Relations between related measures, such as produced crude ore and marketable crude ore, are analyzed for consistency. Engineering relations, such as recovery factors from ores and concentrates, also are used. The totals for each form are verified, and currently reported data are checked against prior reports to detect possible errors or omissions.

For the majority of the surveys, which are automated, the forms are reviewed to ensure that data are complete and correct before entering into the computer data base. The computer is programmed to conduct a series of automated checks to verify mathematical consistency and to identify discrepancies between the data reported and logically acceptable responses.

The USGS is modernizing and automating the minerals information survey-processing and data-dissemination functions. Automated commodity data system functions include computerized preparation of statistical tables, the use of desktop publishing to integrate text and tables, and electronic dissemination through the Internet. Also, information on minerals and mineral-related publications is available through an easy-to-use automated fax response system known as MINES FaxBack.

Survey Responses.—To enable the reader to understand better the basis on which the statistics are calculated, each commodity annual report includes a section about domestic data coverage. This section briefly describes the data sources, the number of establishments surveyed, the response percentage, and the method of estimating the production or consumption for nonrespondents.

To produce reliable aggregated data, the USGS uses efficient procedures for handling instances of nonresponse. Failure to return the initial survey form results in a second mailing of the form. If the second form is not returned, then telephone calls are made to the nonrespondents. The followup calls provide the necessary data to complete the survey forms and/or to verify questionable data entries. Periodic visits to minerals establishments also are made by USGS mineral commodity specialists to gather missing data and to explain the importance of the establishment's reporting. By describing the use of the published statistics and showing the impact of nonresponse, the USGS strives to encourage respondents to give complete and accurate replies.

The OMB publication "Guidelines for Reducing Reporting Burden" stipulates that the minimum acceptable response rate is 75% of the panel surveyed. In addition, the USGS strives for a minimum reporting level of 75% of the quantity produced or consumed (depending on the survey) for certain key statistics. Response rates are periodically reviewed. For those surveys not meeting the minimum reporting level, procedures are developed and implemented to improve response rates.

Estimation for Nonresponse.—When efforts to obtain a response to a survey fail, estimation or imputation techniques must be used to account for missing data. Some of the estimation methods depend on knowledge of prior establishment reporting, and other techniques rely on external information to estimate the missing data. When survey forms are received after the current publication has been completed, the forms are edited, necessary imputations are made for missing data, and the survey data base is updated. The revised data are reported in later publications.

Protection of Proprietary Data.—The USGS relies on the cooperation of the U.S. minerals industry to provide the mineral data that are presented in this and other USGS publications. Without a strong response to survey requests, the USGS would not be able to present reliable statistics. The USGS, in turn, respects the proprietary nature of the data received from the individual companies and establishments. To ensure that proprietary rights will not be violated, the USGS analyzes each of the aggregated statistics to determine if the data reported by an individual establishment can be deduced from the aggregated statistics. If, for example, only two significant producers of a mineral commodity are in a given State, then the USGS will not publish the State total because either producer could readily estimate the production of the other. It is this obligation to protect proprietary information that results in the withheld, or W, entries in the published tables. If a company gives permission in writing, however, then the USGS will publish the data as long as the data from other respondents are protected from disclosure.

International Data

International data are collected by USGS country specialists and international data coordinators. The data are gathered from various sources, which include published reports of foreign Government mineral and statistical agencies, international organizations, the U.S. Department of State, the United Nations, the Organization of Petroleum Exporting Countries, and personal contact by specialists traveling abroad. Each February, annual Minerals Questionnaires that are sent to foreign organizations request them to provide estimates of mineral production for the host country for the preceding year. Missing data are estimated by USGS country specialists on the basis of historical trends and the specialist's knowledge of current production capabilities in each country.

Publications

The USGS disseminates current and historical minerals information through a broad range of printed publications.

The Minerals Yearbook summarizes annually, on a calendar-year basis, the significant economic and technical developments in the mineral industries. Three volumes are issued each year–Volume I, Metals and Minerals; Volume II, Area Reports, Domestic; and Volume III, Area Reports, International. Volume I presents, by mineral commodity, salient statistics on production, trade, consumption, reserves, and other measures of economic activity. The chapters are issued separately as annual Mineral Industry Surveys (MIS) before the bound volume is available. Volume II reviews the U.S. minerals industry by State and island possessions. Volume III is published as four separate regional reports that cover more than 190 foreign countries. These reports contain individual country chapters that examine the mining, refining, processing, and use of minerals in each country in the region and how they relate to U.S. industry.

The MIS contain timely statistical and economic data on minerals. The surveys are designed to keep Government agencies and the public, particularly the mineral industry and the business community, informed of trends in the production, distribution, inventories, and consumption of minerals. Frequency of issue depends on the demand for current data. The MIS are released monthly, quarterly, semiannually, and annually.

Mineral Commodity Summaries (MCS), which is an up-to-date summary of about 80 nonfuel mineral commodities, is the earliest Government publication to furnish estimates that cover the previous year's nonfuel mineral industry data. It contains information on the domestic industry structure, Government programs, tariffs, 5-year salient domestic statistics, and a summary of significant events, trends, and issues in the international minerals industry during the past year.

Metal Industry Indicators (MII), which is published monthly, contains indexes that measure the current and future performance of five U.S. metal industries. For each of the five industries, a composite coincident index and a composite leading index have been developed based on procedures and data similar to those used to construct the Conference Board's coincident and leading cyclical indicators for the national economy. Leading and coincident indexes for the stone, clay, glass, and concrete products industries, which measure the current and future performance of the industrial minerals industry, also are published monthly. The indexes were designed by using the same procedures as the USGS metal composite indexes.

The MIS and the MII are available at no charge from Publication Distribution, Cochrans Mill Road, P.O. Box 18070, Pittsburgh, PA 15236, (412) 386-6156 or (412) 386-6160. Orders may be placed via electronic mail to pitpdrequests@cdc.gov. The Minerals Yearbooks and the MCS may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, (202) 512-1800.

Some minerals information publications are also available on a CD-ROM format. The Minerals and Materials Information CD-ROM, which contains the Minerals Yearbooks, the MCS and other publications, is updated three times per year. It is available from the Government Printing Office at the address and telephone number listed above.

Electronic Data Dissemination

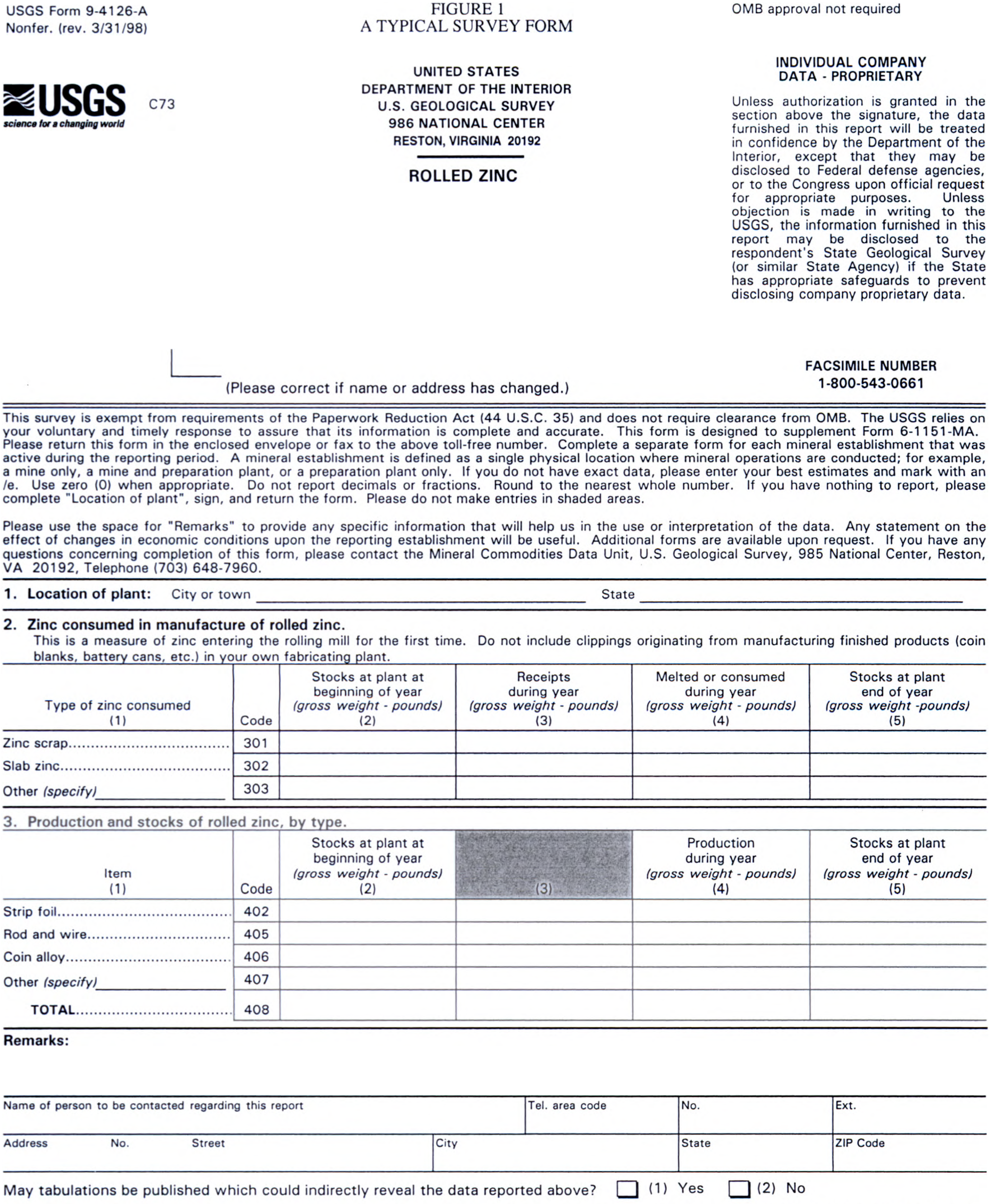
In addition to the USGS printed publications, current information on minerals and mineral-related publications from the USGS is available through an easy-to-use site on the World Wide Web. The URL is http://minerals.usgs.gov/minerals/. All minerals information series publications from 1996 are available to view or download. The web site also provides information on other products and contacts for minerals information and links to other mineral-related sites on the World Wide Web.

The USGS automated fax response system, MINES FaxBack, allows callers to retrieve information and order some publications for delivery to their fax machines in minutes, 24 hours per day, 7 days per week. MINES FaxBack makes monthly, quarterly, and annual MIS publications available to the public at the same time they are forwarded to the printer.

MINES FaxBack works from any Group III-compatible fax machine equipped with a touch-tone telephone (either a built-in handset with touch-tone capability or a separate touch-tone telephone plugged into the fax machine’s phone jack). After calling MINES FaxBack, the requestor is guided by a series of voice messages that assist the caller in ordering the desired documents. The caller pays for the phone call that also includes the time needed to deliver the requested document to the caller's fax machine.

To access the MINES FaxBack System, use a touch-tone handset attached to a fax machine or connect a touch-tone telephone to the fax machine's telephone jack and dial (703) 648-4999. Listen to the menu options and select an option by using the appropriate touch-tone telephone button. After completing a selection, press the start button on the fax machine.

FIGURE 1
A TYPICAL SURVEY FORM



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DATA - PROPRIETARY

Unless authorization is granted in the section above the signature, the data furnished in this report will be treated in confidence by the Department of the Interior, except that they may be disclosed to Federal defense agencies, or to the Congress upon official request for appropriate purposes. Unless objection is made in writing to the USGS, the information furnished in this report may be disclosed to the respondent's State Geological Survey (or similar State Agency) if the State has appropriate safeguards to prevent disclosing company proprietary data.

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This survey is exempt from requirements of the Paperwork Reduction Act (44 U.S.C. 35) and does not require clearance from OMB. The USGS relies on your voluntary and timely response to assure that its information is complete and accurate. This form is designed to supplement Form 6-1151-MA. Please return this form in the enclosed envelope or fax to the above toll-free number. Complete a separate form for each mineral establishment that was active during the reporting period. A mineral establishment is defined as a single physical location where mineral operations are conducted; for example, a mine only, a mine and preparation plant, or a preparation plant only. If you do not have exact data, please enter your best estimates and mark with an /e. Use zero (0) when appropriate. Do not report decimals or fractions. Round to the nearest whole number. If you have nothing to report, please complete "Location of plant", sign, and return the form. Please do not make entries in shaded areas.

Please use the space for "Remarks" to provide any specific information that will help us in the use or interpretation of the data. Any statement on the effect of changes in economic conditions upon the reporting establishment will be useful. Additional forms are available upon request. If you have any questions concerning completion of this form, please contact the Mineral Commodities Data Unit, U.S. Geological Survey, 985 National Center, Reston, VA 20192, Telephone (703) 648-7960.

1. Location of plant: City or town ______________________ State ______________________

2. Zinc consumed in manufacture of rolled zinc.
This is a measure of zinc entering the rolling mill for the first time. Do not include clippings originating from manufacturing finished products (coin blanks, battery cans, etc.) in your own fabricating plant.

Type of zinc consumed (1)	Code	Stocks at plant at beginning of year *(gross weight - pounds)* (2)	Receipts during year *(gross weight - pounds)* (3)	Melted or consumed during year *(gross weight - pounds)* (4)	Stocks at plant end of year *(gross weight -pounds)* (5)
Zinc scrap....................................	301				
Slab zinc......................................	302				
Other *(specify)*______________	303				

3. Production and stocks of rolled zinc, by type.

Item (1)	Code	Stocks at plant at beginning of year *(gross weight - pounds)* (2)	(3)	Production during year *(gross weight - pounds)* (4)	Stocks at plant end of year *(gross weight - pounds)* (5)
Strip foil......................................	402				
Rod and wire................................	405				
Coin alloy....................................	406				
Other *(specify)*______________	407				
TOTAL..................................	408				

Remarks:

Name of person to be contacted regarding this report	Tel. area code	No.	Ext.

Address No. Street	City	State	ZIP Code

May tabulations be published which could indirectly reveal the data reported above? ☐ (1) Yes ☐ (2) No

PRELIMINARY STATISTICAL SUMMARY

By Stephen D. Smith

This preliminary report summarizes data on crude nonfuel mineral production[1] for the United States, its island possessions, and the Commonwealth of Puerto Rico.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this annual report is what is termed "mine output." This term refers to minerals or ores in the form in which they are first extracted from the ground, but customarily may include the output from auxiliary processing at or near the mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. For copper, gold, lead, silver, tin, and zinc, the quantities shown are recorded on a mine basis (as the recoverable content of ore sold or treated). The values assigned to the quantities, however, are based on the average selling price of refined metal, not the mine value. Mercury is measured as recovered metal and valued at the average New York price for the metal. Values shown are in current dollars, with no adjustments made to compensate for changes in the purchasing power of the dollar.

The preliminary total value of all nonfuel mineral production in the United States decreased by less than 1% to $39.1 billion in 1999, with metals decreasing by almost 11% to $10 billion, and industrial minerals increasing by more than 3% to $29.1 billion compared with those of 1998.[2] Nine of the mineral commodities produced in the United States in 1999 had preliminary individual total production values that were greater than $1 billion. These commodities were, in descending order, stone (crushed), cement (portland), sand and gravel (construction), gold, copper, iron ore (usable), lime, phosphate rock, and clays (kaolin). They composed slightly more than 79% of the U.S. total production value (table 1).

In 1999, 14 States produced nonfuel mineral commodities with preliminary individual total production values that were greater than $1 billion. These States were, in descending order, California, Nevada, Arizona, Florida, Georgia, Texas, Michigan, Minnesota, Missouri, Pennsylvania, Utah, Alaska, Alabama, and Ohio. They composed slightly more than 62% of the U.S. total production value (table 3).

---

[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1999 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Metals:							
Antimony 3/	metric tons	356	W	242	W	W	W
Beryllium concentrates	do.	5,760	6	6,080	7	5,900	7
Copper 4/		1,940	4,580,000	1,860	3,220,000	1,660	2,730,000
Gold 4/	kilograms	362,000 r/	3,870,000 r/	366,000	3,480,000	340,000	3,060,000
Iron ore, usable		62,800	1,890,000	63,200	1,970,000	56,000	1,760,000
Iron oxide pigments, crude	metric tons	46,900	7,580	46,100	7,290	45,000	7,780
Lead 4/	do.	448,000	460,000	481,000	480,000	516,000	497,000
Magnesium metal	do.	125,000	400,000	106,000	344,000	W	W
Molybdenum 3/	do.	59,100	W	52,100	W	44,100	W
Palladium	kilograms	8,400	49,700	10,600	98,600	10,200	105,000
Platinum	do.	2,610	33,200	3,240	38,800	3,200	37,600
Rare-earth metal concentrates	metric tons	20,000 e/	W	5,000 e/	14,400 e/	5,000 e/	14,400 e/
Silver 4/	do.	2,180 r/	343,000 r/	2,060	339,000	1,860	320,000
Zinc 4/	do.	605,000	860,000	722,000	819,000	744,000	858,000
Combined value of bauxite, manganiferous ore, mercury, titanium concentrates, tungsten, vanadium, zirconium concentrates and values indicated by symbol W		XX	614,000	XX	447,000 r/	XX	649,000
Total		XX	13,100,000	XX	11,300,000	XX	10,000,000
Industrial minerals, excluding fuels:							
Asbestos	metric tons	6,890	W	5,760	W	6,350	W
Barite		692	15,500	476	11,400	375	11,600
Boron minerals		604 5/	580,000	1,170	486,000	657 5/	498,000
Bromine	metric tons	247,000	198,000	230,000	162,000	231,000	201,000
Cement:							
Masonry		3,630	339,000 e/	3,990	391,000 e/	4,090	402,000 e/
Portland		78,900	5,710,000 e/	79,900	6,030,000 e/	81,900	6,180,000 e/
Clays:							
Ball		1,040	48,100	1,130	51,100	1,140	52,200
Bentonite		4,020	169,000	3,820	176,000	3,850	165,000
Common		24,500	149,000	24,500	146,000	24,700	143,000
Fire		649	9,450	410	7,520	410	7,520
Fuller's earth		2,370	255,000	2,350	230,000	2,350	228,000
Kaolin		9,410	1,040,000	9,450	1,050,000	9,710	1,120,000
Diatomite		766	184,000	725	180,000	W	W
Feldspar	metric tons	900,000	42,500	820,000	40,800	900,000	45,300
Garnet, industrial	do.	64,900	6,050	74,000	7,070	64,400	6,370
Gemstones		NA	25,000	NA	14,300	NA	13,000
Gypsum, crude		18,600	132,000	19,000	132,000	19,400	134,000
Helium:							
Crude	million cubic meters	37	33,700	33	29,700	40	36,200
Grade-A	do.	104	206,000	110	219,000	112	222,000
Iodine	metric tons	1,320	19,600	1,490	22,700	1,630	24,600
Kyanite		W	W	90	13,200	90	13,000
Lime		19,600	1,200,000	20,100	1,210,000	20,500	1,240,000
Mica, crude		114	9,400	87	7,550	94	9,680
Peat		750	17,500	785	18,900	775	20,200
Perlite, crude	metric tons	706,000	23,300	685,000	21,800	726,000	22,900
Phosphate rock, marketable		45,900	1,080,000	44,200	1,110,000	41,500	1,210,000
Potash		3,000	320,000	3,000	320,000	2,400	270,000
Pumice and pumicite	metric tons	577,000	16,100	583,000	12,600	617,000	16,600
Salt		40,600	993,000	40,800	986,000	41,000	964,000
Sand and gravel:							
Construction		952,000	4,260,000	1,080,000	4,920,000	1,080,000	5,070,000
Industrial		28,500	518,000	28,200	513,000	28,300	514,000

See footnotes at end of table.

TABLE 1--Continued
NONFUEL MINERAL PRODUCTION IN THE UNITED STATES 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Industrial minerals, excluding fuels--Continued:							
Silica stone 6/	metric tons	445	2,560	438	3,440	NA	NA
Sodium compounds:							
Soda ash		10,700	915,000	10,100	842,000	10,100	800,000
Sodium sulfate, natural		318	34,700	250	20,000	(7/)	(7/)
Stone, crushed 8/		1,420,000	8,050,000 r/	1,510,000	8,130,000	1,560,000	8,610,000
Tripoli	metric tons	81,300	16,400	79,600	16,900	116,000	25,800
Zeolites	do.	30,100	NA	38,500	NA	NA	NA
Combined value of brucite, emery, greensand marl, lithium minerals, magnesite, magnesium compounds, olivine, staurolite, stone (dimension), sulfur (Frasch), talc and pyrophyllite, vermiculite (crude), wollastonite and values indicated by symbol W		XX	803,000	XX	636,000	XX	812,000
Total		XX	27,400,000	XX	28,200,000 r/	XX	29,100,000
Grand total		XX	40,500,000	XX	39,400,000 r/	XX	39,100,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value."
XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Content of ore and concentrate.

4/ Recoverable content of ores, etc.

5/ Weight reported as B_2O_3 and may not be comparable to other years.

6/ Includes grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

7/ Canvassing discontinued.

8/ Excludes abrasive stone and bituminous limestone and sandstone; all included elsewhere in table.

TABLE 2

NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 1999 p/

(Principal States based upon quantity unless otherwise noted)

Mineral	Principal States	Other States (Alphabetical order)
Antimony 1/	ID	
Asbestos	CA	
Barite	NV, GA, TN	
Beryllium concentrate	UT	
Boron minerals	CA	
Bromine	AR and MI	
Brucite	NV	
Cement:		
Masonry	SC, IN, FL, CA, AL	AZ, AR, CO, GA, HI, IA, KS, KY, ME, MD, MI, MO, MT, NE, NM, NY, OH, OK, PA, SD, TN, TX, VA, WA, WV.
Portland	CA, TX, PA, MI, AL	All other States, except AK, CT, DE, LA, MA, MN, NH, NJ, NC, ND, RI, VT, WI.
Clays:		
Ball	TN, KY, MS, TX, IN	
Bentonite	WY, MT, MS, AL, AZ	CA, OR, NV, TX, UT.
Common	AL, NY, NC, LA, TX	All other States, except AK, DE, HI, ID, NV, NH, RI, VT, WI.
Fire	MO, OH, CA, AL, SC	KY and NM.
Fuller's earth	GA, CA, MS, MO, VA	FL, IL, KS, NV, TN, TX.
Kaolin	GA, SC, TX, AL, AR	CA, FL, NV, NC, PA.
Copper 1/	AZ, UT, NM, MT, NV	AK, ID, MO.
Diatomite	CA, NV, OR, WA	
Emery	OR	
Feldspar	NC, CA, VA, GA, OK	ID and SD.
Garnet, abrasive	ID, NY, MT	
Gemstones, natural 2/	TN, AZ, NC, AR, CA	All other States.
Gold 1/	NV, AK, CA, UT, SD	AZ, CO, ID, MT, NM, SC, WA.
Greensand marl	NJ and TX	
Gypsum, crude	OK, TX, IA, MI, CA	AZ, AR, CO, IN, KS, LA, NV, NM, NY, OH, SD, UT, VA, WY.
Helium:		
Crude	KS, TX, OK	
Grade-A	KS, WY, OK, UT, CO	TX.
Iodine	OK	
Iron ore, usable	MN, MI, MO, SD, NV	CA, MT, NM.
Iron oxide pigments, crude	GA, MO, VA, MI, AL	AZ.
Kyanite	VA	
Lead 1/	MO, AK, ID, MT, NY	CO and TN.
Lime	MO, AL, KY, TX, OH	All other States, except AK, CT, DE, FL, HI, KS, ME, MD, MS, NH, NJ, NM, NY, NC, RI, VT.
Lithium minerals	NV	
Magnesite	NV	
Magnesium compounds	MI, FL, UT, CA, DE	
Magnesium metal	UT and WA	
Mercury	NV	
Mica, crude	NC, GA, SC, NM, SD	
Molybdenum	AZ, CO, ID, UT, MT	NM.
Olivine	WA and NC	
Palladium metal	MT	
Peat	FL, MI, ME, MN, IL	IN, IA, MT, NJ, NY, NC, OH, PA, WA, WV, WI.
Perlite, crude	NM, AZ, OR, CA, UT	ID and NV.
Phosphate rock	FL, NC, ID, UT	
Platinum metal	MT	
Potash	NM, UT, MI	
Pumice and pumicite	CA, AZ, OR, NM, ID	KS.
Rare-earth metal concentrates	CA	
Salt	LA, OH, NY, KS, MI	AL, AZ, CA, MI, NV, NM, OK, TN, TX, UT, WV.
Sand and gravel:		
Construction	CA, TX, OH, AZ, MI	All other States.
Industrial	IL, CA, TX, NJ, WI	All other States, except AK, CT, DE, HI, KY, ME, MT, NH, NM, OR, SD, UT, VT, WY.
Silver 1/	AK, NV, ID, AZ, UT	CA, CO, MO, MT, NM, NY, SC, SD, WA.
Soda ash	WY and CA	
Staurolite	FL	

See footnotes at end of table.

TABLE 2--Continued
NONFUEL MINERALS PRODUCED IN THE UNITED STATES, BY COMMODITY AND STATES IN 1999 p/

(Principal States based upon quantity unless otherwise noted)

Mineral	Principal States	Other States (Alphabetical order)
Stone:		
Crushed	PA, NC, GA, TX, AL	All other States, except DE.
Dimension	VT, IN, PA, MN, TX	All other States, except AK, DE, FL, HI, IL, IA, KY, LA, MS, NE, NV, NJ, ND, OR, RI, UT, WY.
Sulfur, Frasch	LA and TX	
Talc and pyrophyllite	MT, TX, VT, NY, NC	CA, OR, VA.
Titanium concentrates:		
Ilmenite	FL, VA, CA	
Rutile	FL	
Tripoli	AR, IL, OK, PA	
Vanadium 1/	ID	
Vermiculite, crude	SC and VA	
Wollastonite	NY	
Zinc 1/	AK, TN, MO, NY, MT	ID and CO.
Zircon concentrates	FL and VA	

p/ Preliminary.

1/ Content of ores, etc.

2/ Principal producing States based on value.

TABLE 3
VALUE OF NONFUEL MINERAL PRODUCTION IN THE UNITED STATES AND PRINCIPAL NONFUEL MINERALS PRODUCED IN 1999 p/ 1/

State	Value (thousands)	Rank	Percent of U.S. total	Principal minerals, in order of value
Alabama	$1,080,000	13	2.76	Stone (crushed), cement (portland), lime, sand and gravel (construction), cement (masonry).
Alaska	1,090,000	12	2.78	Zinc, gold, lead, silver, sand and gravel (construction).
Arizona	2,510,000	3	6.42	Copper, sand and gravel (construction), cement (portland), molybdenum, stone (crushed).
Arkansas	520,000	28	1.33	Bromine, stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial).
California	3,180,000	1	8.12	Sand and gravel (construction), cement (portland), boron minerals, stone (crushed), soda ash.
Colorado	555,000	26	1.42	Sand and gravel (construction), cement (portland), stone (crushed), gold, molybdenum.
Connecticut 2/	103,000	42	0.26	Stone (crushed), sand and gravel (construction), stone (dimension), clays (common), gemstones.
Delaware 2/	9,620	50	0.03	Sand and gravel (construction), magnesium compounds, gemstones.
Florida	1,930,000	4	4.93	Phosphate rock, stone (crushed), cement (portland), sand and gravel (construction), titanium (ilmenite) concentrates.
Georgia	1,840,000	5	4.71	Clays (kaolin), stone (crushed), cement (portland), clays (fuller's earth), sand and gravel (construction).
Hawaii	88,800	45	0.23	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), gemstones.
Idaho	420,000	32	1.07	Phosphate rock, silver, sand and gravel (construction), molybdenum, gold.
Illinois	945,000	16	2.42	Stone (crushed), cement (portland), sand and gravel (construction), sand and gravel (industrial), lime.
Indiana	717,000	19	1.83	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Iowa	537,000	27	1.37	Stone (crushed), cement (portland), sand and gravel (construction), gypsum (crude), lime.
Kansas	566,000	25	1.45	Cement (portland), salt, stone (crushed), helium (Grade-A), helium (crude).
Kentucky	510,000	29	1.30	Stone (crushed), lime, cement (portland), sand and gravel (construction), clays (ball).
Louisiana	348,000	33	0.89	Salt, sulfur (Frasch), sand and gravel (construction), sand and gravel (industrial), clays (common).
Maine	101,000	43	0.26	Sand and gravel (construction), cement (portland), stone (crushed), peat, cement (masonry).
Maryland	336,000	34	0.86	Stone (crushed), cement (portland), sand and gravel (construction), cement (masonry), stone (dimension).
Massachusetts	211,000	39	0.54	Stone (crushed), sand and gravel (construction), stone (dimension), lime, clays (common).
Michigan	1,660,000	7	4.24	Iron ore (usable), cement (portland), sand and gravel (construction), stone (crushed), magnesium compounds.
Minnesota	1,580,000	8	4.04	Iron ore (usable), sand and gravel (construction), stone (crushed), stone (dimension), sand and gravel (industrial).
Mississippi	168,000	41	0.43	Sand and gravel (construction), cement (portland), clays (fuller's earth), sand and gravel (industrial), clays (ball).
Missouri	1,380,000	9	3.52	Stone (crushed), cement (portland), lead, lime, zinc.
Montana	491,000	30	1.26	Palladium, copper, gold, cement (portland), platinum.
Nebraska 2/	96,400	44	0.25	Cement (portland), sand and gravel (construction), stone (crushed), lime, cement (masonry).
Nevada	2,780,000	2	7.10	Gold, sand and gravel (construction), silver, lime, diatomite.
New Hampshire 2/	63,600	47	0.16	Sand and gravel (construction), stone (crushed), stone (dimension), gemstones.
New Jersey	300,000	37	0.77	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), greensand marl, peat.
New Mexico	671,000	21	1.72	Copper, potash, sand and gravel (construction), cement (portland), perlite (crude).
New York	935,000	17	2.39	Stone (crushed), cement (portland), salt, sand and gravel (construction), zinc.
North Carolina	761,000	18	1.95	Stone (crushed), phosphate rock, sand and gravel (construction), sand and gravel (industrial), feldspar.
North Dakota	37,700	48	0.10	Sand and gravel (construction), lime, stone (crushed), sand and gravel (industrial), clays (common).
Ohio	1,040,000	14	2.67	Stone (crushed), sand and gravel (construction), salt, lime, cement (portland).
Oklahoma	477,000	31	1.22	Stone (crushed), cement (portland), sand and gravel (construction), helium (Grade-A), sand and gravel (industrial).
Oregon	303,000	36	0.77	Stone (crushed), sand and gravel (construction), cement (portland), diatomite, lime.
Pennsylvania	1,280,000	10	3.28	Stone (crushed), cement (portland), sand and gravel (construction), lime, cement (masonry).
Rhode Island 2/	25,400	49	0.07	Stone (crushed), sand and gravel (construction), sand and gravel (industrial), gemstones.
South Carolina	574,000	24	1.47	Cement (portland), stone (crushed), cement (masonry), sand and gravel (construction), gold.
South Dakota	226,000	38	0.58	Gold, cement (portland), sand and gravel (construction), stone (crushed), stone (dimension).
Tennessee	710,000	20	1.81	Stone (crushed), zinc, cement (portland), sand and gravel (construction), clays (ball).
Texas	1,780,000	6	4.54	Cement (portland), stone (crushed), sand and gravel (construction), lime, salt.
Utah	1,260,000	11	3.21	Copper, magnesium metal, gold, sand and gravel (construction), cement (portland).
Vermont 2/	83,300	46	0.21	Stone (dimension), stone (crushed), sand and gravel (construction), talc and pyrophyllite, gemstones.
Virginia	667,000	22	1.71	Stone (crushed), cement (portland), sand and gravel (construction), lime, clays (fuller's earth).
Washington	631,000	23	1.61	Sand and gravel (construction), stone (crushed), magnesium metal, cement (portland), gold.
West Virginia	180,000	40	0.46	Stone (crushed), cement (portland), sand and gravel (industrial), lime, salt.
Wisconsin 2/	334,000	35	0.85	Stone (crushed), sand and gravel (construction), lime, sand and gravel (industrial), stone (dimension).
Wyoming	956,000	15	2.44	Soda ash, clays (bentonite), helium (Grade-A), cement (portland), stone (crushed).
Undistributed	85,700	XX	0.22	
Total	39,100,000	XX	100.00	

p/ Preliminary. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Partial total; excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed."

TABLE 4
VALUE OF NONFUEL MINERAL PRODUCTION PER CAPITA AND PER SQUARE KILOMETER IN 1999 , BY STATE p/ 1/

State	Area (square kilometers)	Population (thousands)	Total value (thousands)	Per capita		Per square kilometer	
				Dollars	Rank	Dollars	Rank
Alabama	134,000	4,370	$1,080,000	247	12	8,070	12
Alaska	1,530,000	620	1,090,000	1,760	2	711	48
Arizona	295,000	4,780	2,510,000	525	6	8,500	10
Arkansas	138,000	2,550	520,000	204	15	3,780	27
California	411,000	33,100	3,180,000	96	31	7,730	14
Colorado	270,000	4,060	555,000	137	21	2,060	40
Connecticut	13,000	3,280	103,000 2/	31	48	7,900	13
Delaware	5,290	754	9,620 2/	13	50	1,820	42
Florida	152,000	15,100	1,930,000	128	24	12,700	2
Georgia	153,000	7,790	1,840,000	236	13	12,100	4
Hawaii	16,800	1,190	88,800	75	38	5,300	25
Idaho	216,000	1,250	420,000	335	8	1,940	41
Illinois	146,000	12,100	945,000	78	37	6,480	21
Indiana	93,700	5,940	717,000	121	25	7,650	15
Iowa	146,000	2,870	537,000	187	16	3,680	29
Kansas	213,000	2,650	566,000	213	14	2,660	34
Kentucky	105,000	3,960	510,000	129	23	4,870	26
Louisiana	124,000	4,370	348,000	80	36	2,810	33
Maine	86,200	1,250	101,000	80	35	1,170	46
Maryland	27,100	5,170	336,000	65	39	12,400	3
Massachusetts	21,500	6,180	211,000	34	47	9,830	9
Michigan	152,000	9,860	1,660,000	168	17	10,900	5
Minnesota	219,000	4,780	1,580,000	331	9	7,230	18
Mississippi	124,000	2,770	168,000	61	41	1,360	43
Missouri	181,000	5,470	1,380,000	252	11	7,640	16
Montana	381,000	883	491,000	557	5	1,290	44
Nebraska	200,000	1,670	96,400 2/	58	43	481	49
Nevada	286,000	1,810	2,780,000	1,540	3	9,710	8
New Hampshire	24,000	1,200	63,600 2/	53	44	2,650	35
New Jersey	20,200	8,140	300,000	37	46	14,900	1
New Mexico	315,000	1,740	671,000	386	7	2,130	39
New York	127,000	18,200	935,000	51	45	7,350	17
North Carolina	136,000	7,650	761,000	100	28	5,580	24
North Dakota	183,000	634	37,700	60	42	206	50
Ohio	107,000	11,300	1,040,000	93	32	9,750	7
Oklahoma	181,000	3,360	477,000	142	19	2,630	36
Oregon	251,000	3,320	303,000	91	33	1,200	45
Pennsylvania	117,000	12,000	1,280,000	107	27	10,900	6
Rhode Island	3,140	991	25,400 2/	26	49	8,080	11
South Carolina	80,600	3,890	574,000	148	18	7,130	19
South Dakota	200,000	733	226,000	308	10	1,130	47
Tennessee	109,000	5,480	710,000	129	22	6,500	20
Texas	691,000	20,000	1,780,000	89	34	2,570	37
Utah	220,000	2,130	1,260,000	590	4	5,720	23
Vermont	24,900	594	83,300 2/	140	20	3,350	31
Virginia	106,000	6,870	667,000	97	30	6,320	22
Washington	176,000	5,760	631,000	110	26	3,580	30
West Virginia	62,800	1,810	180,000	99	29	2,860	32
Wisconsin	145,000	5,250	334,000 2/	64	40	2,290	38
Wyoming	253,000	480	956,000	1,990	1	3,770	28
Undistributed	XX	XX	85,700	XX	XX	XX	XX
Total or average	9,370,000 3/	272,000 3/	39,100,000	144	XX	4,170	XX

p/ Preliminary. XX Not applicable.

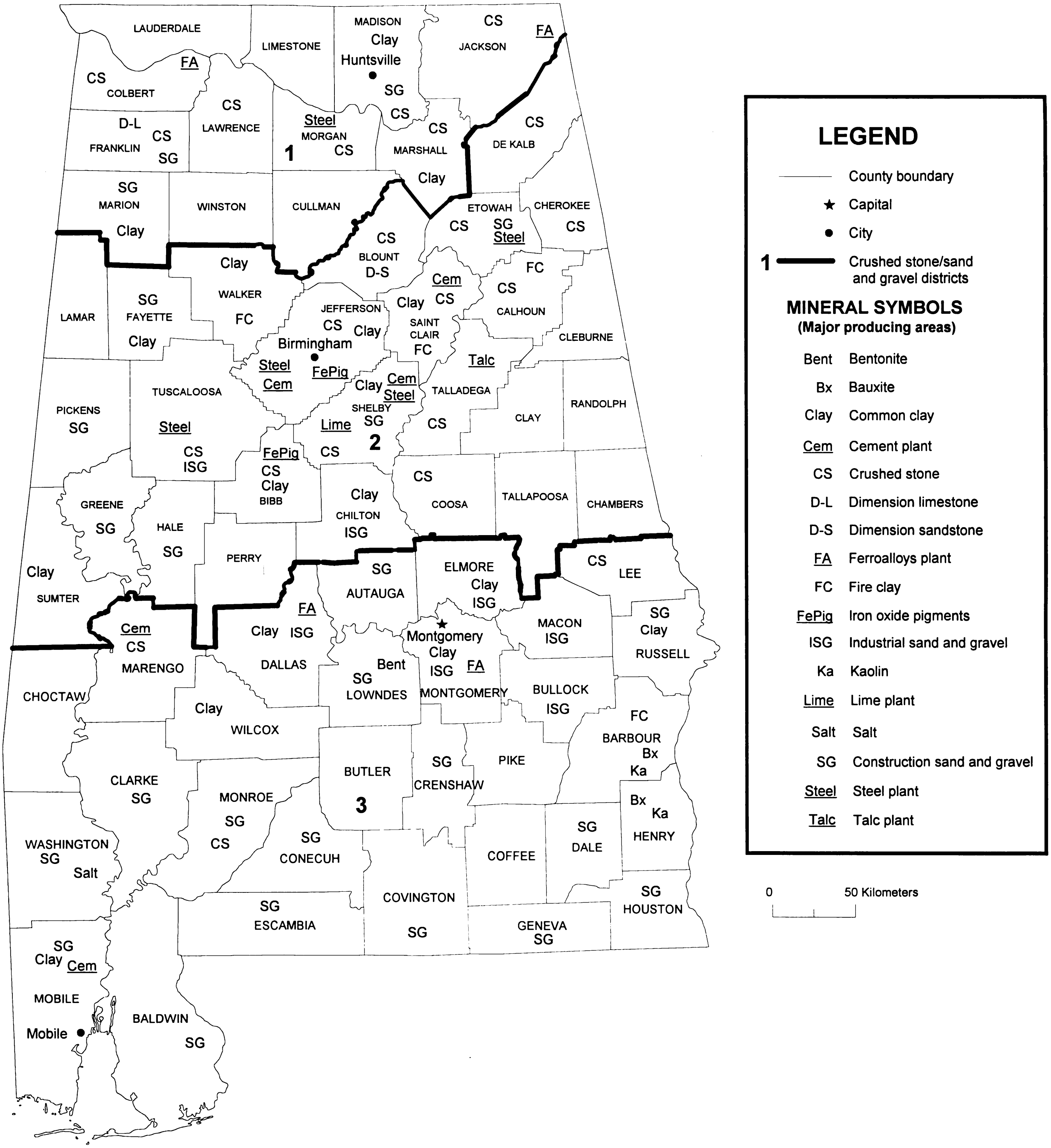
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Partial total; excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed."

3/ Excludes Washington, DC (which has no mineral production), with an area of 179 square kilometers and a population of 519,000.

Sources: U.S. Geological Survey and U.S. Census Bureau.

ALABAMA



Source: Geological Survey of Alabama/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF ALABAMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Geological Survey of Alabama for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Alabama was almost $1.1 billion, according to the U.S. Geological Survey (USGS). This was about a 7% increase from that of 1998,[2] following a 14.6 % increase from 1997 to 1998. The State rose in rank to 13th from 14th among the 50 States in total nonfuel mineral production value, of which Alabama accounted for almost 3% of the U.S. total.

The top four nonfuel mineral commodities produced in Alabama in 1999 were, in descending order of value, crushed stone, cement, lime, and construction sand and gravel, accounting for 95% of the State's total production value. The combined value of crushed stone and portland cement represented 73% of the total. Of the State's overall increase in value from 1998 to 1999, about 61% of it resulted from the $43 million increase in crushed stone plus $9 million increases in portland cement and lime and a $7 million increase in construction sand and gravel (table 1). Most other nonfuel minerals increased in value, except for bentonite and common clay, which had relatively small decreases, and fire clay, gemstones, and crude iron oxide pigments which remained the same. In 1998, crushed stone, up $110 million, was the leading mineral commodity contributing to Alabama's significant increase in nonfuel mineral value. Smaller yet significant increases also occurred (in descending order of change) in portland cement, construction sand and gravel, lime, and masonry cement (table 1).

Nonfuel mineral production in Alabama consisted entirely of industrial minerals; no metals were mined in the State. Compared with USGS estimates of the quantities produced in the other 49 States in 1999, Alabama remained first in common clays, second in bentonite (sharing second with Montana), third in kaolin and lime, fourth in iron oxide pigments, fifth in masonry cement, sixth in portland cement and fire clays, and seventh in salt. Additionally, Alabama's stone quarries and sand pits produced substantial quantities of crushed stone and construction and industrial sand and gravel. All metal production in the State, especially that of raw steel, was the result of processing materials acquired from other domestic and foreign sources. Bauxite is no longer mined in Alabama to produce primary aluminum. Production of a natural mixture of bauxite and bauxitic clay with a very low iron oxide content has been reported to the USGS since 1995 as kaolin; it is primarily used to make refractory (high-temperature-resistant) products.

The Geological Survey of Alabama[3] provided the narrative information that follows. Record production for the State of crushed stone (limestone, dolomite, granite, marble, sandstone, and quartzite) was achieved in 1999. Limestone, used for lime and cement production and as a construction material, led in this production. The Alabama Development Office reported recent capital investment in expanding industrial mineral operations to be over $35 million. This included crushed stone, refractory clay, calcium carbonate, lime, and salt (solution mining) (Alabama Development Office, 1999).

In Alabama's minerals industry there were several large expansions as well as plans to build a new cement plant. The French minerals group Imetal SA completed its acquisition of the English China Clays PLC (ECC) marble operation in Sylcauga, AL. The consolidation of the ECC operation with the adjoining operation of the Georgia Marble Co., a wholly owned subsidiary of Imetal, makes the marble operation at Sylcauga one of the largest operations in the United States for ground calcium carbonate for use in a variety of industrial applications (Sinclair, 1999). Wise Metals Group of Baltimore, MD, completed its acquisition of the Reynolds Metals Co. Listerhill operation in the northern part of the State. The Reynolds plant had been in operation since 1941. The reorganized operation, Wise Alloys LLC, will supply metal for beverage can manufacturing (Palmer, 1999). Blue Circle Cement Co. announced plans to invest $230 million in building a new cement plant to expand its operation in Shelby County, one of the leading lime producing areas in the United States. The Blue Circle operation is designed to use new technology that will keep it competitive in the global market (Daniels, 1999).

Mineral exploration continued to focus mostly on industrial mineral resources but some exploration for metals occurred. Metals exploration focused on tantalum in Coosa County and gold in Cleburne County (Burgert, 1998). Plans to restart tantalum production in Coosa County were delayed until 2000 (Burgert, 1999). The Alabama Department of Environmental Management issued a discharge permit for a precious metals operation near Borden Springs in Cleburne County (Surrett, 1999).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Lewis S. Dean, a geologist at the Geological Survey of Alabama, authored the text of the State mineral industry information provided by that agency.

The Geological Survey of Alabama published its annual minerals industry summary that provides details of the occurrence, mining history, and general economics of specific mineral resources in Alabama. More information on geology, hydrology, and environmental considerations related to these resources is available from the Geological Survey of Alabama.

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALABAMA 1/ 2/

(Thousand metric tons and thousand dollars)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	346	36,200 e/	371	39,100 e/	380	40,000 e/
Portland	4,280	344,000 e/	4,310	353,000 e/	4,410	362,000 e/
Clays: Common	2,590	25,400	2,400	23,100	2,410	22,500
Gemstones	NA	860	NA	76	NA	76
Lime	1,830	115,000	1,960	119,000	2,100	128,000
Sand and gravel:						
Construction	13,400	58,800	14,400	64,100	15,700	71,100
Industrial	734	9,730	757	9,910	776	10,500
Stone: Crushed	42,000	273,000	48,900	383,000	53,000	426,000
Combined values of clays (bentonite, fire, kaolin), iron oxide pigments (crude), salt, stone (dimension limestone and sandstone)	XX	17,600	XX	18,500	XX	21,000
Total	XX	881,000	XX	1,010,000	XX	1,080,000

e/ Estimated. p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
ALABAMA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	45	37,300	$194,000	$5.21	53	42,900	$286,000	$6.66
Dolomite	3	W	W	5.47	3	W	W	5.54
Marble	2	W	W	35.38	4	2,240	76,300	34.09
Sandstone	--	--	--	--	3	W	W	5.00
Granite	4	W	W	5.47 r/	3	W	W	5.51
Slate	1	W	W	5.18 r/	1	W	W	5.79
Miscellaneous stone	--	--	--	--	1	67	477	7.12
Total or average	XX	42,000	273,000	6.51	XX	48,900	383,000	7.83

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch)			
Riprap and jetty stone	103	$624	$6.06
Other coarse aggregate	495	3,850	7.77
Total or average	598	4,470	7.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	399	2,360	5.92
Bituminous aggregate, coarse	W	W	5.87
Bituminous surface-treatment aggregate	W	W	5.35
Other graded coarse aggregate	W	W	5.83
Total or average	8,390	48,900	5.83
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	6.11
Screening, undesignated	W	W	5.56
Other fine aggregate	W	W	5.61
Total or average	2,120	11,900	5.61
Coarse and fine aggregates:			
Graded road base or subbase	W	W	10.32
Terrazzo and exposed aggregate	W	W	7.61
Crusher run or fill or waste	W	W	5.84
Other coarse and fine aggregates	W	W	6.07
Total or average	5,460	33,300	6.09
Other construction materials	1,150	3,790	3.31
Agricultural:			
Agricultural limestone	165	1,100	6.67
Poultry grit and mineral food	58	700	12.07
Other agricultural uses	130	1,270	9.73
Total or average	353	3,070	8.68
Chemical and metallurgical:			
Cement manufacture	3,060	26,800	8.76
Lime manufacture	W	W	12.89
Dead-burned dolomite manufacture	W	W	5.75
Flux stone	W	W	6.36
Total or average	7,450	79,300	10.65
Special:			
Mine dusting or acid water treatment	W	W	15.75
Whiting or whiting substitute	W	W	55.09
Other fillers or extenders	W	W	40.21
Roofing granules	W	W	35.00
Total or average	1,540	71,500	46.50
Other miscellaneous uses: Other specified uses not listed	548	2,420	4.41
Unspecified: 3/			
Actual	14,900	87,800	5.91
Estimated	6,410	36,300	5.66
Total or average	21,300	124,000	5.83
Grand total or average	48,900	383,000	7.83

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone, and slate.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
ALABAMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

	District 1		District 2		District 3	
Use	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Construction aggregates:						
Coarse aggregate (+1-1/2 inch) 2/	225	1,520	340	2,420	W	W
Coarse aggregate, graded 3/	3,600	20,800	W	W	W	W
Fine aggregate (-3/8 inch) 4/	817	4,710	W	W	W	W
Coarse and fine aggregate 5/	2,910	15,000	2,060	12,200	W	W
Other construction materials	--	--	7,100	37,200	642	8,500
Agricultural 6/	(7/)	(7/)	(7/)	(7/)	(7/)	(7/)
Chemical and metallurgical 8/	--	--	6,080	73,500	(7/)	(7/)
Special 9/	--	--	(7/)	(7/)	--	--
Other miscellaneous uses	--	--	548	2,420	--	--
Unspecified: 10/						
Actual	(7/)	(7/)	10,700	64,700	1,570	8,650
Estimated	(7/)	(7/)	4,780	27,200	(7/)	(7/)
Total	11,700	65,000	33,300	293,000	3,880	24,600

W Withheld to avoid disclosing company proprietary data, included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and other graded coarse aggregate.

4/ Includes stone sand (concrete), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase, terrazzo and exposed aggregates, crusher run (select material or fill), and other coarse and fine aggregate.

6/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

7/ Withheld to avoid disclosing company proprietary data, included in "Total."

8/ Includes cement manufacture, lime manufacture, dead-burned dolomite manufacture, and flux stone.

9/ Includes mine dusting or acid water treatment, whiting or whiting substitute, other fillers or extenders, and roofing granules.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products 2/	4,250	$16,600	$3.90
Asphaltic concrete aggregates and other bituminous mixtures	597	2,360	3.95
Road base and coverings	724	2,480	3.42
Road and other stabilization (lime)	44	72	1.64
Fill 3/	171	366	2.14
Unspecified: 4/			
Actual	4,260	21,400	5.03
Estimated	4,360	20,900	4.78
Total or average	14,400	64,100	4.45

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
ALABAMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	833	4,280	116	431	3,300	11,900
Asphaltic concrete aggregates	270	1,040	--	--	327	1,320
Road base and coverings 3/	--	--	225	759	542	1,790
Fill 4/	59	216	49	54	63	96
Unspecified: 5/						
Actual	--	--	1,420	7,030	2,840	14,400
Estimated	232	1,160	283	1,470	3,850	18,200
Total	1,390	6,700	2,090	9,740	10,900	47,600

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

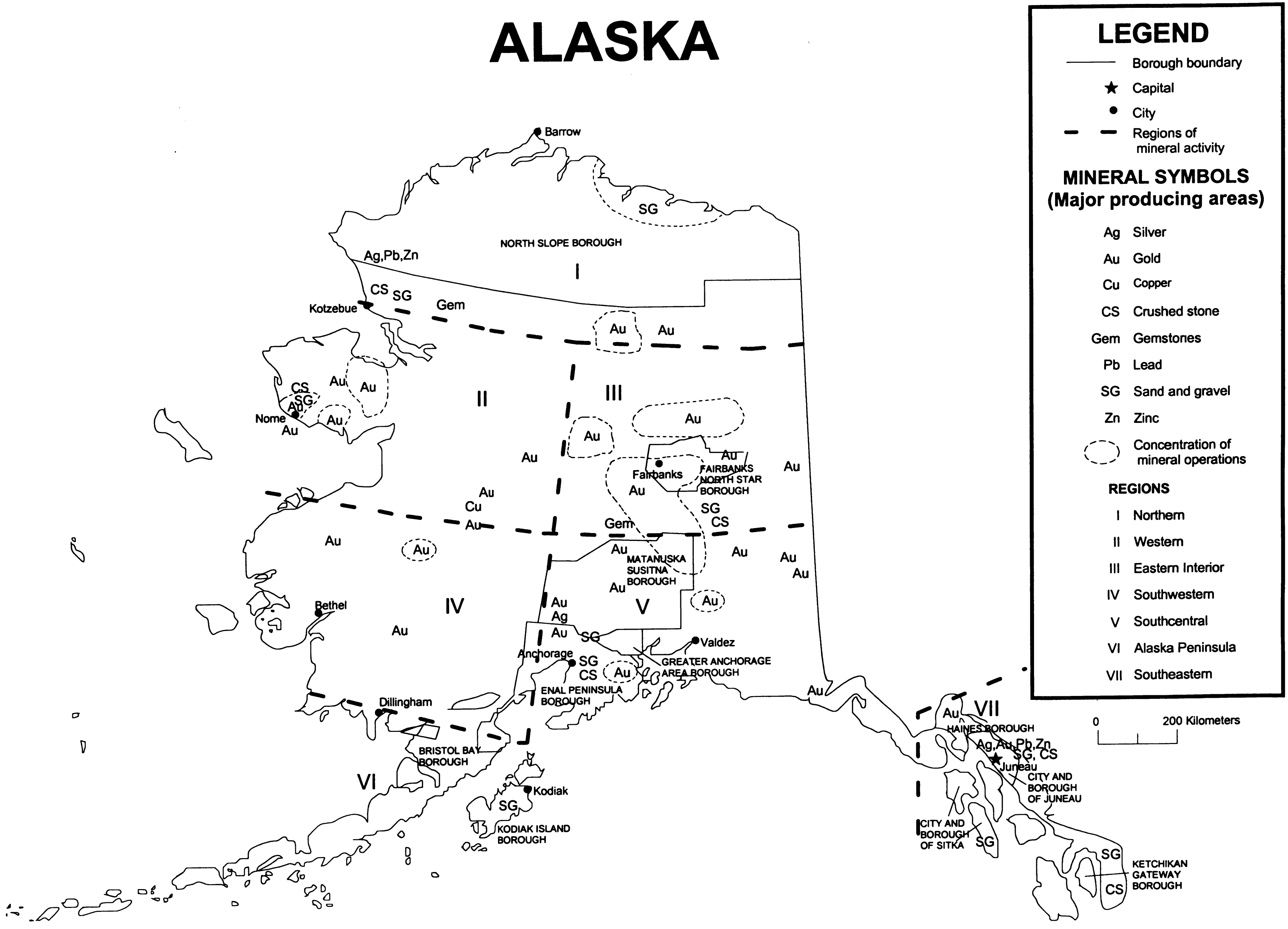
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (lime).

4/ Includes snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

ALASKA



Source: Alaska Division of Geological and Geophysical Surveys/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF ALASKA

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Alaska was about $1.1 billion, according to the U.S. Geological Survey (USGS). This was about a 9% decrease from that of 1998,[2] following a 1.6% increase from 1997 to 1998. The State, which rose in rank in 1999 to 12th from 15th among the 50 States in total nonfuel mineral production value, accounted for close to 3% of the U.S. total.

Overall, metallic minerals accounted for more than 92% of the State's total nonfuel mineral production value in 1999. A large majority of this was from zinc, lead, and silver production at Cominco Alaska Inc.'s Red Dog Mine, which is near Kotzebue in northwestern Alaska, and gold production from the Kinross Gold Corp.'s Fort Knox Mine, which is near Fairbanks in east-central Alaska. (Listings of mineral commodities are in descending order of value, magnitude of change in value, or quantity produced.) In 1999, most of the State's increase in nonfuel mineral value resulted from a 17% increase in the production of lead; 16%, silver; and 13%, zinc. Crushed stone also showed a relatively small increase. Only gold, construction sand and gravel, and copper showed decreased values. Gemstones remained the same. In 1998, significant decreases in the production and values of gold and crushed stone were more than balanced by increases in those of zinc, lead, construction sand and gravel, and silver resulting in the State's rise in value (table 1).

On the basis of USGS estimates of the quantities produced in the 50 States during 1999, Alaska remained first in zinc and second in lead. The State remained second in the production of silver and third in gold.[3] Production of peat was not reported to the USGS, partly because of reporting difficulties associated with the seasonal, intermittent nature of the mineral commodity's mining in the State. The Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys (DGGS), estimated peat production to be about 29,100 cubic meters for an estimated value of about $190,000. Additionally, the DGGS reported production of jade and soapstone to be about 1.8 metric tons (t) at an estimated value of $25,000 (Swainbank and Szumigala, 2000).

The DGGS provided the following narrative information; the data are based on DGGS surveys and estimates (Swainbank and Szumigala, 2000). The Red Dog Mine increased production of lead, zinc, and silver and continued to be the world's largest producer of zinc. The Red Dog Mine produced 522,000 t of zinc, 90,000 t of lead, and an estimated 190 t of silver in 1999, which accounted for almost 70% of all metal produced in Alaska.

Kennecott's Greens Creek Mine, which is west of Juneau, remained one of the largest producers of silver in the United States, and continued to produce significant amounts of lead, zinc, and gold. The mine produced an estimated 57,000 t of zinc, 21,000 t of lead, 2.5 t of gold, and 317 t of silver from about 517,000 t of ore milled.

Fort Knox Mine, which is near Fairbanks, was Alaska's largest gold producer—10.9 t in 1999. A 1999 report commissioned by the Fairbanks North Star Borough showed that the mine created 260 direct and 312 indirect jobs in Fairbanks, spent more than $35 million per year on local goods and services, and had a $107-million-per-year impact on the local economy. Although production from all the placer mines in the State has not yet been fully accounted for, it appears to be in excess of 1.6 t.

The underground Nixon Fork Mine, which is near McGrath, was placed on care-and-maintenance status in May but produced about 310 kilograms (kg) of gold and 600 t of copper in 1999 before closing. Likewise, the Illinois Creek (Dakota Mining Co.) open pit mine, which is near Galena, was on care-and-maintenance status for the year but produced about 210 kg of gold and 1,900 kg of silver as the existing heaps were rinsed. Kvaerner Environmental Technologies Inc. continued its closure of the A-J Mine in downtown Juneau.

Development expenditures were about $26 million, mainly at the Red Dog Mine, the Fort Knox Mine, the Kensington Mine (Coeur Alaska's mine north of Juneau), and the Greens Creek Mine in 1999, compared with $55.4 million in 1998. The drop was mainly because the Production Rate Increase Project at the Red Dog Mine had not been completed by the end of 1998; in 1999, the mine was performing at the expected rate.

Development at the Red Dog Mine was mainly at the port site, with drainage projects and modification of the conveyor system, as well as modification of the flotation system at the mine site, which is 84 kilometers inland. The port may possibly be modified in the future to allow direct loading of ships rather than the present system of lightering concentrates with barges to ships anchored offshore.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Gold figures in table 1 for 1997 and 1999, as reported to the USGS, conflict with estimates made by the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys (DGGS). The canvassing of gold placer mineral production was discontinued by the U.S. Bureau of Mines (the Federal agency formerly responsible for U.S. nonfuel mineral production data collection) in 1994. Gold production and value data in table 1 contain 1997 and preliminary 1999 numbers that will be further estimated by the USGS in cooperation with the DGGS. Current estimates based on data collected by the DGGS indicate the production quantity in 1997 was 18,400 kilograms (kg) valued at $207 million; and in 1999, 15,700 kg valued at $140 million (Swainbank and Szumigala, 2000). The USGS final 1997 and 1999 total gold production and value data for Alaska, done in collaboration with the DGGS, will be reflected in the upcoming USGS Mineral Industry Surveys - Gold, 1999 Annual Review.

At the Fort Knox Mine, pit dewatering and random waste disposal accounted for most of the development reported, but about 3,900 meters (m) of in-pit development drilling confirmed additional reserves.

At the Greens Creek Mine, Kennecott drove about 1,500 m of development drifts to access the new ore reserves.

At the Kensington Mine, mining optimization studies continued throughout the year.

Exploration highlights included the discovery at depth of a new zinc-rich ore body north of the Red Dog Mine and expansion of the gold mineralized zone at the Pogo property east of Fairbanks. Other exploration programs in the Pogo area identified new gold-rich areas that will require further exploration and drilling.

Estimated minimum exploration expenditures throughout Alaska during 1999 were $48.2 million, which was down 16% from the $57.3 million invested in 1998. Alaska's exploration sector fared quite well, considering the massive reductions (20% to 30%) in exploration budgets worldwide. The eastern interior region of Alaska consumed 69% of exploration expenditures. The Goodpaster mining district was the hub of exploration activity as companies conducted initial exploration programs on claims that had been staked around the Pogo property in 1998.

About 8,800 new State mining claims and 230 new Federal claims were staked in Alaska in 1999. The Noatak district was the most active area for new claim locations, followed by staking in the Big Delta quadrangle in the Goodpaster and the Richardson mining districts.

In 1999, the DGGS contracted for an airborne geophysical survey of about 2,600 square kilometers northwest of the Pogo deposit. The survey included radiometrics with the standard electromagnetic and magnetic components. The results were expected in early 2000. A magnetic/electromagnetic survey of parts of Prince of Wales Island in southeastern Alaska was completed in 1999 with funding from the U.S. Bureau of Land Management, the Ketchikan Gateway Borough, the cities of Coffman Cove and Helm Bay, and the Alaska State Mental Health Land Office, with additional survey data from previous years provided by the Sealaska Native Corp.

A team of geologists from the DGGS began investigations in the Fortymile area, which had been the subject of a 1998 airborne survey. A preliminary geologic map of the Eagle A-2 quadrangle will be released later this year. Field mapping will continue in 2000.

The State Division of Mining, Land, and Water Management, which was working with the USGS, continued its studies of the natural water quality for baseline studies in the Fortymile and the Goodpaster River drainages east of Fairbanks.

Reference Cited

Swainback, R.C., and Szumigala, D.J., 2000, Alaska's mineral industry 1999—A summary: Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys, Information Circular 46, 12 p.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ALASKA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	11	NA	11	NA	11
Gold 3/ 4/ kilograms	18,400	196,000	18,300	174,000	18,200	164,000
Sand and gravel: Construction	12,500	57,400	13,700	72,700	13,200	71,200
Stone: Crushed 5/	3,350 r/	23,600 r/	1,700	9,970	1,790	10,800
Combined values of copper, lead, silver, stone [crushed dolomite and limestone (1997), crushed dolomite, limestone, shell, slate (1998-99)], zinc	XX	706,000	XX	743,000	XX	843,000
Total	XX	983,000	XX	999,000	XX	1,090,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Data collected by the State.

5/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
ALASKA: CRUSHED STONE SOLD OR USED, BY KIND 1/ 2/

	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone-dolomite	1	W	W	$3.28 r/	1	W	W	$3.60
Shell	1	(3/)	(3/)	5.78	1	W	W	4.33
Traprock	4 r/	612 r/	$2,000 r/	3.27	5	605	$2,700	4.46
Slate	1	(3/)	(3/)	4.72 r/	1	W	W	6.86
Miscellaneous stone	5	2,670	21,400	8.00	9	1,100	7,270	6.64
Total or average	XX	3,350 r/	23,6 00 r/	7.05 r/	XX	1,700	9,970	5.86

r/ Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 3
ALASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/ 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregates (+1 1/2 inch):			
Riprap and jetty stone	3	$37	$12.23
Filter stone	10	91	9.13
Coarse aggregate, graded:			
Concrete aggregate, coarse	46	182	3.95
Bituminous aggregate, coarse	7	58	8.34
Fine aggregate (-3/8 inch): Screening, undesignated	3	44	14.61
Coarse and fine aggregates:			
Graded road base or subbase	42	321	7.65
Unpaved road surfacing	17	108	6.35
Crusher run or fill or waste	17	127	7.48
Other construction materials	20	94	4.70
Other specified uses not listed	1	3	3.14
Unspecified: 4/			
Actual	977	6,465	6.62
Estimated	555	2,438	4.39
Total or average	1,700	9,970	5.86

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Data derived, in part, from information obtained from the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys.

3/ Recoverable content of ores, etc.

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
ALASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

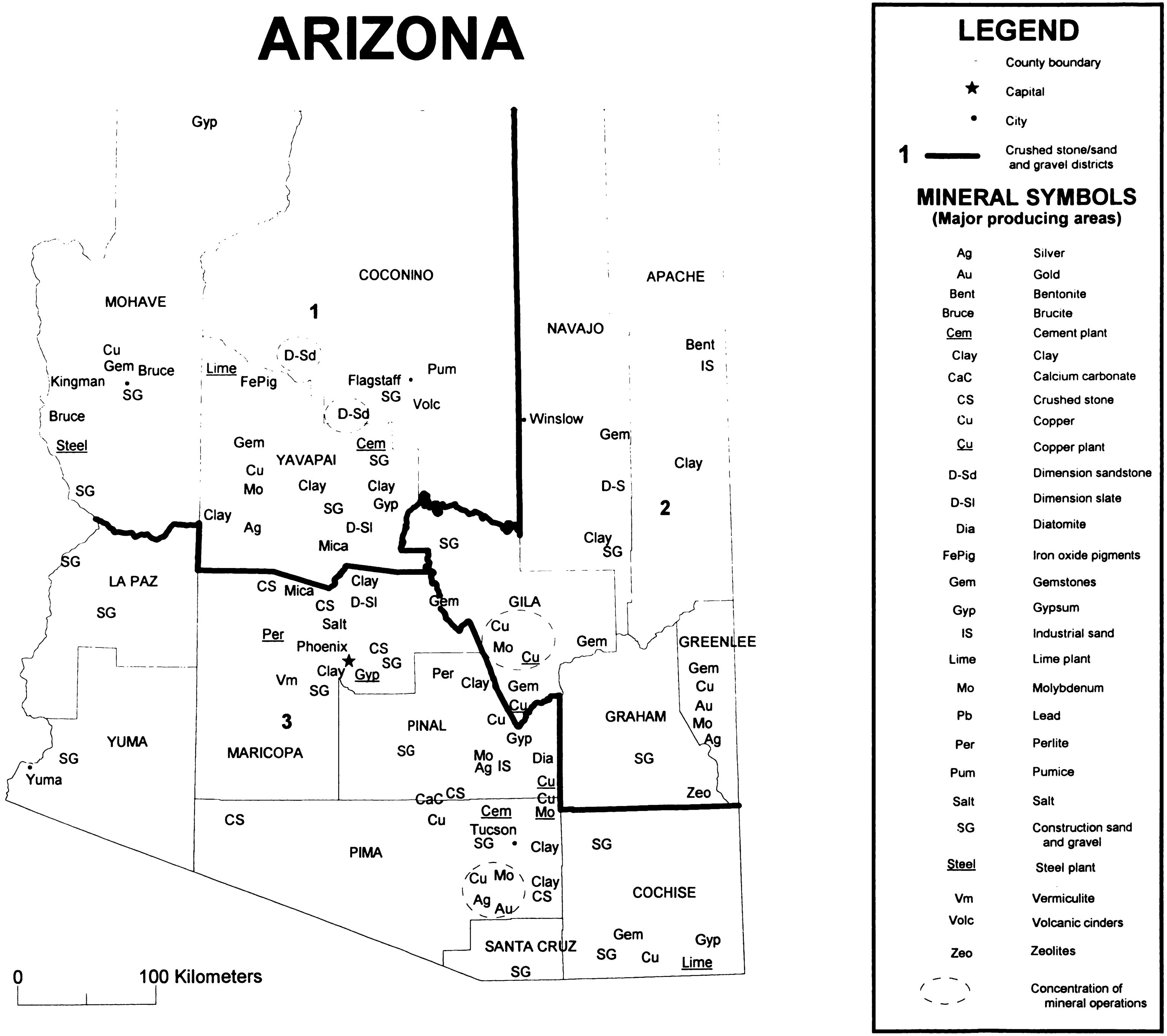
Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates and concrete products	328	$2,150	$6.55
Asphaltic concrete aggregates and other bituminous mixtures	346	4,440	12.82
Road base and coverings	1,310	6,930	5.29
Fill	386	1,050	2.71
Snow and ice control	28	127	4.54
Railroad ballast	91	650	7.14
Unspecified: Actual 3/	11,200	57,300	5.10
Total or average	13,700	72,700	5.29

1/ To avoid disclosing company proprietary data, no region tables were produced for 1998.

2/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

3/ Reported and estimated production without a breakdown by end use.

ARIZONA



Source: Arizona Department of Mines and Minerals Resources/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF ARIZONA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arizona Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Arizona was $2.5 billion, according to the U.S. Geological Survey (USGS). This was about an 8% decrease from the $2.74 billion of 1998,[2] and followed a 22.6% decrease from 1997 to 1998. The State ranked third in the Nation in total nonfuel mineral production value, of which Arizona accounted for more than 6% of the U.S. total.

Arizona continued in 1999 as the top copper-producing State, accounting for about two-thirds of total U.S. copper mine production and value. Copper was the State's leading nonfuel mineral, representing 72% of Arizona's 1999 total nonfuel mineral production value. In 1999, copper mine production was down more than 7%, and the value of production was down by about 12%. The decrease in copper's value, about $250 million, accounted for most of the State's decrease in nonfuel mineral value. Smaller yet significant decreases occurred in gold, which was down about $11 million, while lime decreased by about $7 million, and silver was down approximately $2 million. These losses were tempered somewhat by a $35 million increase in construction sand and gravel, a $5 million rise in portland cement, and about a $2 million increase in crushed stone. All other changes in value were on the order of $1 million or less. In 1998, the $880 million decrease in the value of copper was the most significant change affecting the State's mineral economy, followed by a $5 million decrease in the value of gold. Significant increases occurred in the values of construction sand and gravel, molybdenum, portland cement, and silver (table 1).

Based upon USGS estimates of the quantities produced in the 50 States during 1999, Arizona remained the leading State in molybdenum output, 2d in gemstones and crude perlite, 4th in silver and zeolites, 5th in construction sand and gravel and pumice and pumicite, and 11th in the production of gold. While the State rose to 5th from 6th in iron oxide pigments and to 6th from 7th in bentonite, it decreased from 9th to 10th in dimension stone. Additionally, Arizona was a significant producer of portland cement, lime, and gypsum.

The Arizona Department of Mines and Mineral Resources[3] provided the following narrative information. More than 18,000 people were employed by 72 mining companies, operating 126 mines, and by 70 sand and gravel producers in the State.

In 1999, Arizona's copper production declined to 1.1 million metric tons (Mt). Copper output at the Ray Mine was 152,000 metric tons (t) in 1998, of which 41,000 t came from its solvent extraction electrowinning (SX-EW) operations. This 24% increase in SX-EW production from the previous year resulted from using new technology and higher concentrations of acid in the leach dumps. In July 1999, a combined 36,000-metric-ton-per-year (t/yr) reduction was announced for Ray and Mission, which was forecast to reduce ASARCO Incorporated's 1999 North American production by about 7%. At Ray, harder ore would reduce output by 11,000 t. As part of a negotiated settlement with the U.S. Environmental Protection Agency and State agencies, Asarco would extend the Mineral Creek diversion tunnel around the Ray Mine workings at a cost of $55 million. When completed, the project will shorten hauls and increase leach and dump capacity. At the end of 1998, Ray had ore reserves of 863 Mt grading 0.6% sulfide copper and 161 Mt of leachable copper ore grading 0.45%.

Mission's copper production in 1998 was 116,000 t, up 1,800 t from 1997. The increase was attributed to new loading and hauling equipment, including a large overland conveyor system designed to move 53 million metric tons per year of waste. More importantly, it reduced waste haulage costs by 11%. Accounting for 43% of Arizona's silver production, Mission was Arizona's largest silver producer with 79 t recovered as a byproduct. The cutback announced for Mission in 1999 meant that 150 employees were laid off and that copper production was trimmed by 25,000 t/yr. Mission's reserves at the end of 1998 were about 450 Mt of ore grading 0.7% copper. The Hayden smelter, an INCO Ltd. flash furnace rated at 650,000 t/yr of charge, produced 173,000 t of copper in 1998. Modernization of the smelter's gas handling system and the process control system was completed in 1998.

In June 1999, Broken Hill Proprietary Copper Co. (BHP) announced that the San Manuel underground mine and smelter would be closed, eliminating 2,200 jobs. In October, the rod mill ceased production. Prior to these layoffs, BHP was the State's largest copper employer. The San Manuel Mine produced 123,000 t of copper in the fiscal year that ended May 1, 1999. Byproduct gold recovered was more than 715 kilograms for the same period. San Manuel's and Lower

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Nyal J. Niemuth, Mining Engineer, authored the text of State minerals information provided by the Arizona Department of Mines and Mineral Resources.

Kalamazoo's ore reserves were 205 Mt of sulfide ore at an estimated grade of 0.62% copper as of 1998.

BHP's San Manuel smelter, the largest single furnace copper smelter, which had been operating since 1988 without a rebuild, was shut down for 2 months in the spring of 1999 for a $66 million rebuilding and modernization effort. Improvements included installing a new burner design, new draft fans, and a waste heat boiler; constructing a 36,000 t concentrate storage building; and improving the conveyor systems to reduce spillage and airborne contamination. The project was completed but the smelter did not restart because of the mine's closure.

With the shutdown of BHP's smelter, BHP's Florence's in-situ leach start up plans were postponed. The Florence Mine's oxide resources of 291 Mt averaging 0.34% copper are expected to produce 33,000 t/yr of cathode copper for 15 years.

Phelps Dodge Corp., headquartered in Phoenix, is the world's largest producer of SX-EW cathode copper. Following its merger with Cyprus Amax Minerals Co., it will produce about one-half of the United State's mined copper from its properties in Arizona and southwestern New Mexico. The Morenci Mine (Phelps Dodge, 85%, and Sumitomo Metal Mining Co., Ltd., 15%) in Greenlee County, the largest copper mine in North America, produced 474,000 t of copper in 1998 and 435,000 t in 1999.

The Morenci Mine produced 224,000 t of copper in concentrate and 250,000 t of electrolytic copper in 1998. Production dropped to 177,000 t in concentrate and rose to 258,000 t of electrolytic copper in 1999, largely due to the closing of the Metcalf concentrator in August. The closure was part of a plan to reduce costs by phasing out sulfide concentration and by converting Morenci to an all leach operation by 2002. As part of an expansion of leach output, construction began on installing mechanical stackers and agglomeration equipment. The Metcalf crushing plant will continue to be used for leach operations. The larger Morenci concentrator will be phased out during the next 2 years, but will be maintained to provide flexibility in production. Although no layoffs were expected from the Morenci concentrator closure, 250 contract employees were laid off with the Metcalf mill closure.

Morenci's milling reserves totaled more than 377 Mt grading 0.64% copper, while leaching reserves totaled more than 1.69 billion metric tons at the end of 1999. Additional resources at Morenci include: Western Copper Mine with an estimated 480 Mt of milling material at a grade of 0.55% copper and 450 Mt of leach material at a grade of 0.31% copper; Garfield, containing 950 Mt grading 0.27% copper; and American Mountain, containing 130 Mt of leach material grading 0.25% copper.

In response to low copper prices during 1998, Cyprus announced it was reducing copper production by 27,000 t from its Bagdad and Sierrita Mines. The cutbacks were made by reducing the use of its highest cost equipment. Additionally, $10 million will be saved by deferring equipment purchases and holding other expenses to support levels.

In 1996, the Sierrita Mine started mining a 63-Mt oxide deposit that led to increased leach output. Cathode production during 1998 was a record 22,000 t, and production from concentrates was 81,000 t of copper. Cost cutting efforts resulted in a 17% reduction in cash unit costs per pound. The mine's byproduct molybdenum credit was 10,000 t in 1998, which was one-third of Cyprus' molybdenum production and made Sierrita the largest molybdenum producer in Arizona. At the end of 1999, Phelps Dodge reported that Sierrita contained sulfide reserves of 964 Mt grading 0.27% and oxide reserves of 58 Mt grading 0.18% copper.

The Bagdad Mine in Yavapai County produced 97,500 t of copper in 1998, a 13% decline from 1997's record level. Compared to a year earlier, a 7% drop in cash costs, normalized to grade of copper mined, was achieved. This resulted from finer ore grind, improved control of the flotation circuit, and other minimal capital efforts. Phelps Dodge reported that at the end of 1999 Bagdad had a 703-Mt sulfide reserve grading 0.37% copper and 0.02% molybdenum, as well as 14.5 Mt of leach material grading 0.29% copper.

All of Miami's operations had outstanding levels of production in 1998. The mine and SX-EW plant produced a record 74,000 t of copper in 1998, a 5% improvement over the 1997 record. The smelter processed 549,000 t of copper concentrates from other Cyprus operations. The refinery produced 172,000 t of cathode, and the rod plant operated above capacity and produced 139,000 t of copper rod in 1998, both amounts were new records. At the end of 1999, Phelps Dodge reported leach reserves for Miami of 171 Mt grading 0.38%.

Although mining was suspended in July 1997 at Cyprus' Tohono test open pit, leaching of heaps continued until February 1999. Production at Tohono totaled 3,600 t of copper during 1998.

After 6 years of effort, the Carlota open pit heap leach SX-EW project is now fully permitted. Carlota Copper Co., a subsidiary of Cambior U.S.A. Inc., received a favorable ruling on litigation contesting the Forest Service's record of decision in August 1999. The property consists of four oxide ore bodies with reserves totaling 87 Mt of ore grading 0.44% copper. Production was planned at a rate of 27,000 t/yr of copper for the first 10 years via openpit mining, heap leaching, and SX-EW. Capital costs were estimated at $100 million. Heavy debt problems related to Cambior's gold hedging activities caused the company to offer the project for sale in late 1999.

In October 1999, Equatorial Mining N.L. secured a 3-year option on the Zonia Mine, Yavapai County, from bankrupt Arimetco International, Inc. A prefeasibility study was planned to evaluate the property's 129 Mt resource grading 0.31% copper.

Nord Resources Corp. of Albuquerque, NM, acquired Johnson Camp Mine in Cochise County from Summo Minerals Corp. in the spring of 1999. The mine, currently on care and maintenance, continued to produce 450,000 t to 900,000 t of copper annually by SX-EW from existing heap leaches. With a rise in copper prices, the mine is expected to reopen and produce 8,200 t/yr of cathode copper.

During the first half of 1999, BHP sought to sell its North American copper operations. Having received no acceptable offers, BHP announced the June 1999 closure of its copper properties, excluding leach production. The San Manuel Mine, smelter, refinery, and mineral complex, along with the Pinto Valley Mine, remained closed at yearend.

In July 1999, Asarco and Cyprus announced a merger of equals' transaction. However, in August, Phelps Dodge initiated an unsolicited takeover attempt of both companies, offering a 30% premium over the companies' existing share prices. The offer was rejected and Phelps Dodge soon increased its offer. In August, Grupo Mexico, S.A. de C.V. made an initial offer to acquire Asarco. In October, Asarco's board of directors accepted Phelps Dodge's offer of $29.50 cash per share, and the merger was signed, contingent upon 80% of the shares being tendered by October 22 and approval by Phelps Dodge's shareholders. Grupo Mexico increased its offer the next day to $29.75 per share, and this offer was eventually accepted. When the companies merged, all Asarco shares were acquired for $29.75 cash for a total transaction value, including assumed debt, of $2.25 billion. Asarco paid a $30 million termination fee to Phelps Dodge.

Grupo Mexico, headquartered in Mexico City, is Mexico's largest mining company. With the purchase of Asarco, it became the third largest copper producer in the world. The two divisions of the company are Grupo Minero Mexico, the mining division, and Grupo Ferroviario Mexico, the railroad division. Grupo Mexico's sales in 1998 totaled $1.4 billion. The Arizona copper operations acquired include the Mission Complex, the Silver Bell Mine, and the Ray-Hayden Complex.

In December 1999, Phelps Dodge acquired Cyprus Amax making it the world's second largest producer of copper and the world's largest molybdenum producer. The total equity value of the purchase was $1.8 billion, based on approximately 90.7 million Cyprus Amax shares outstanding. The Arizona properties acquired were the Sierrita Mine, the Bagdad Mine, and the Miami Complex.

Low gold prices, dropping slightly to average below $280 per ounce in 1999, continued to curb activity. Bema Gold Corp., operating in Arizona as Yarnell Mining Co., ceased funding of the Environmental Impact Statement (under the National Environmental Policy Act) for the Yarnell gold project and closed its engineering office in August. The company is delaying its open pit heap leach operation until prices improve.

Only a few gold exploration projects were active. The Moreau property in La Paz County was drilled by Nevada Pacific Gold Ltd. in late spring. Exploration of the property was continued by Echo Bay Mineral Co., who optioned the property in the fall.

Royal Oak Mines Inc.'s bankruptcy hindered efforts by subsidiary Arctic Precious Metals Inc. to continue exploration of the Copperstone gold deposit. Asia Minerals Corp., who acquired the project, reported an underground resource of about 16 t, and planned further drilling.

Sand and gravel are increasingly important as the Phoenix metropolitan area continues its rapid growth. Phoenix's construction industry was paced by the addition of more than 30,000 new homes in 1998 and 1999 and the associated commercial construction. Creating additional demand for industrial minerals is the accelerated urban freeway and rural highway building program of the Arizona Department of Transportation. The Federal Government passed the Transportation Equity Act for the 21st Century, a multiyear highway-funding law that is expected to increase highway construction spending. The rapidly growing demand for aggregates and concrete has attracted global players, including Pioneer International, Hanson Plc., Vulcan Materials Co., and Cemex S.A. de C.V. to Arizona.

Australia's Pioneer International continued its rapid pace of acquisitions of sand and gravel and concrete producers in Arizona by buying Phoenix Redimix Inc., Wickenburg Concrete and Materials, Valley Concrete and Materials (of Clarkdale), and Yavapai Materials during 1999. The purchase of Phoenix Redimix, for approximately $50 million, itself added more than 27 Mt of aggregate reserves with a life of 15 years at current production rates. With the latest acquisitions, Pioneer is now the second largest concrete producer and the fourth largest aggregate supplier in Arizona, operating 12 concrete batch plants and 6 quarries. Pioneers's combined annual sales are expected to be more than $100 million from more than 760,000 cubic meters of concrete and 3.6 Mt of aggregate.

Vulcan Materials completed its acquisition of Calmat Co. in a deal that began in November 1998 and closed in January 1999. The purchase totaled $760 million plus assumption of Calmat's debt of $130 million. Calmat's southwest U.S. operations included Calmat of Arizona with 479 employees at 7 Phoenix area plants.

In 1999, Salt River Sand & Rock Co., located in Maricopa County, again operated the second largest sand and gravel plant in the United States. Two companies finished construction and development activities for industrial mineral commodities not produced in Arizona for decades. Applied Chemical Magnesias Corp. finished a $2 million grinding and bagging plant at Bullhead City to process brucite from the underground White House Mine in the San Francisco District of Mohave County. AZCO Mining Inc., better known in Arizona for its previous copper activities, developed the Black Canyon (also known as Mica Mule) pegmatite, 48 kilometers (km) north of Phoenix. It will supply mica for a dry- and wet-grinding facility in Glendale.

Omya Arizona Inc. (Pluess Staufer) of Lucerne Valley, CA, broke ground in June for its $30 million calcium carbonate ($CaCO_3$) processing plant at Superior in Pinal County, and is projecting a June 2000 start up. Of the 91,000 t/yr capacity, two-thirds will be for food-grade $CaCO_3$ additives.

In January 2000, the Federal Government created two new national monuments in areas of known mineral potential, the Agua Fria National Monument east of I-17 in southeast Yavapai County and the Shiviwits National Monument north of the Colorado River in Mohave County. Both monuments were created by Presidential order.

The Arizona State Land Department began mineral evaluation programs for copper and sand and gravel occurrences on State Trust Lands in a 48-km perimeter around the Phoenix-Casa Grande/Tucson development corridor. The study will provide the department with information that will assist it in maximizing revenue from the trust lands that may be subject to eventual preservation related to the "growing smarter initiative" and the "Arizona preserve initiative."

In collaboration with many county, State, and Federal agencies, the Arizona State Office of the Bureau of Land Management produced the *Arizona Mining Summit, Guide to Permitting Mining Operations*. This publication includes each permitting agency's authorizing statutes and estimates of the cost and time required to acquire permits and provides contact information.

A more complete discussion of Arizona's mineral industry, along with a detailed listing of the mines and operators, is available in Directory 48, Directory of Active Mines 2000 (available from the Arizona Department of Mines and Mineral Resources).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARIZONA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Copper 3/		1,250	2,940,000	1,190	2,060,000	1,100	1,810,000
Gemstones		NA	2,360	NA	2,120	NA	1,920
Gold 3/	kilograms	2,140	22,800	1,840	17,400	763	6,870
Molybdenum	metric tons	14,400	W	16,600	W	16,800	W
Sand and gravel:							
Construction		39,500	187,000	47,900	229,000	54,000	264,000
Industrial		330	3,160	307	3,290	262	4,120
Silver 3/	metric tons	190	29,900	211	34,700	189	32,500
Stone: Crushed		7,490	44,000	8,080	44,800	8,200	46,700
Zeolites	metric tons	(4/)	NA	(4/)	NA	NA	NA
Combined values of cement, clays (bentonite, common), gypsum, (crude), iron oxide pigments (crude), lime, perlite (crude), pumice and pumicite, salt, stone (dimension sandstone), and values indicated by symbol W		XX	312,000	XX	344,000 r/	XX	344,000
Total		XX	3,540,000	XX	2,740,000 r/	XX	2,510,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Withheld to avoid disclosing company proprietary data.

TABLE 2
ARIZONA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	6	4,590	$23,300	$5.08 r/	7	4,300	$23,900	$5.55
Granite	12	1,590 r/	10,700	6.71 r/	14	2,200	10,900	4.98
Marble	3	W	W	11.69	2	W	W	5.36
Sandstone and quartzite	3 r/	W	W	14.61 r/	3	W	W	10.84
Volcanic cinder and scoria	4	115	135	1.17	7	333	1,600	4.83
Miscellaneous stone	3 r/	W	W	6.13 r/	15	W	W	5.51
Total or average	XX	7,490	44,000	5.86	XX	8,080	44,800	5.54

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	516	$1,500	$2.91
Riprap and jetty stone	47	251	5.34
Filter stone	5	24	4.80
Total or average	568	1,770	3.12
Coarse aggregate, graded: Bituminous aggregate	W	W	4.03
Coarse and fine aggregates:			
Graded road base or subbase	46	153	3.33
Unpaved road surfacing	27	91	3.37
Terrazzo and exposed aggregate	565	4,130	7.32
Other coarse and fine aggregates	108	358	3.31
Total or average	746	4,740	6.35
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	5.58
Lime manufacture	(3/)	(3/)	5.51
Flux stone	(3/)	(3/)	13.99
Total or average	4,300	24,800	5.75
Special: Mine dusting or acid water treatment	W	W	4.14
Other miscellaneous uses: Other specified uses not listed	W	W	4.47
Unspecified: 4/			
Actual	1,020	5,600	5.48
Estimated	1,400	7,690	5.51
Total or average	2,420	13,300	5.50
Grand total or average	8,080	44,800	5.54

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, marble, miscellaneous stone, quartzite, sandstone, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
ARIZONA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	--	--	W	W	--	--
Coarse aggregate, graded 4/	W	W	--	--	W	W	--	--
Coarse and fine aggregate 5/	219	1,680	--	--	527	3,050	--	--
Chemical and metallurgical 6/	1,880	11,400	--	--	2,420	13,400	--	--
Special 7/	--	--	--	--	W	W	--	--
Other miscellaneous uses	32	143	--	--	--	--	--	--
Unspecified: 8/								
Actual	527	2,910	12	42	91	505	--	--
Estimated	162	897	127	700	1,110	6,100	389	2,150
Total	2,830	17,100	139	742	4,720	24,800	389	2,150

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite, limestone, marble, miscellaneous stone, quartzite, sandstone, and volcanic cinder and scoria.

3/ Includes filter stone, macadam, and riprap and jetty stone.

4/ Includes bituminous aggregate (coarse).

5/ Includes graded road base or subbase, terrazzo and exposed aggregates, other coarse and fine aggregates, and unpaved road surfacing.

6/ Includes cement manufacture, lime manufacture, and flux stone.

7/ Includes mine dusting or acid water treatment.

8/ Reported and estimated production without a breakdown by end use.

TABLE 5
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	15,300	$73,900	$4.82
Plaster and gunite sands	493	3,080	6.24
Concrete products (blocks, bricks, pipe, decorative, etc.)	679	3,560	5.24
Asphaltic concrete aggregates and other bituminous mixtures	2,540	9,860	3.88
Road base and coverings 2/	10,800	41,400	3.82
Fill	918	3,900	4.24
Snow and ice control	5	45	9.00
Railroad ballast	22	195	8.86
Other miscellaneous uses 3/	415	1,210	2.91
Unspecified: 4/			
Actual	12,100	67,700	5.58
Estimated	4,540	24,400	5.37
Total or average	47,900	229,000	4.78

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
ARIZONA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	462	2,900	317	2,040	15,200	72,500	--	--
Plaster and gunite sands	29	278	20	186	444	2,610	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	1,520	6,830	802	1,770
Road base materials 2/	800	4,840	738	3,560	8,500	31,700	795	1,310
Fill	W	W	W	W	853	3,690	--	--
Other miscellaneous uses 3/	211	1,210	108	520	409	1,180	--	--
Unspecified: 4/								
Actual	803	5,940	92	152	11,100	61,400	109	180
Estimated	1,270	6,930	215	1,180	3,050	16,300	--	--
Total	3,580	22,100	1,490	7,640	41,100	196,000	1,710	3,260

W Withheld to avoid disclosing company proprietary data, included with "Other miscellaneous uses." -- Zero.

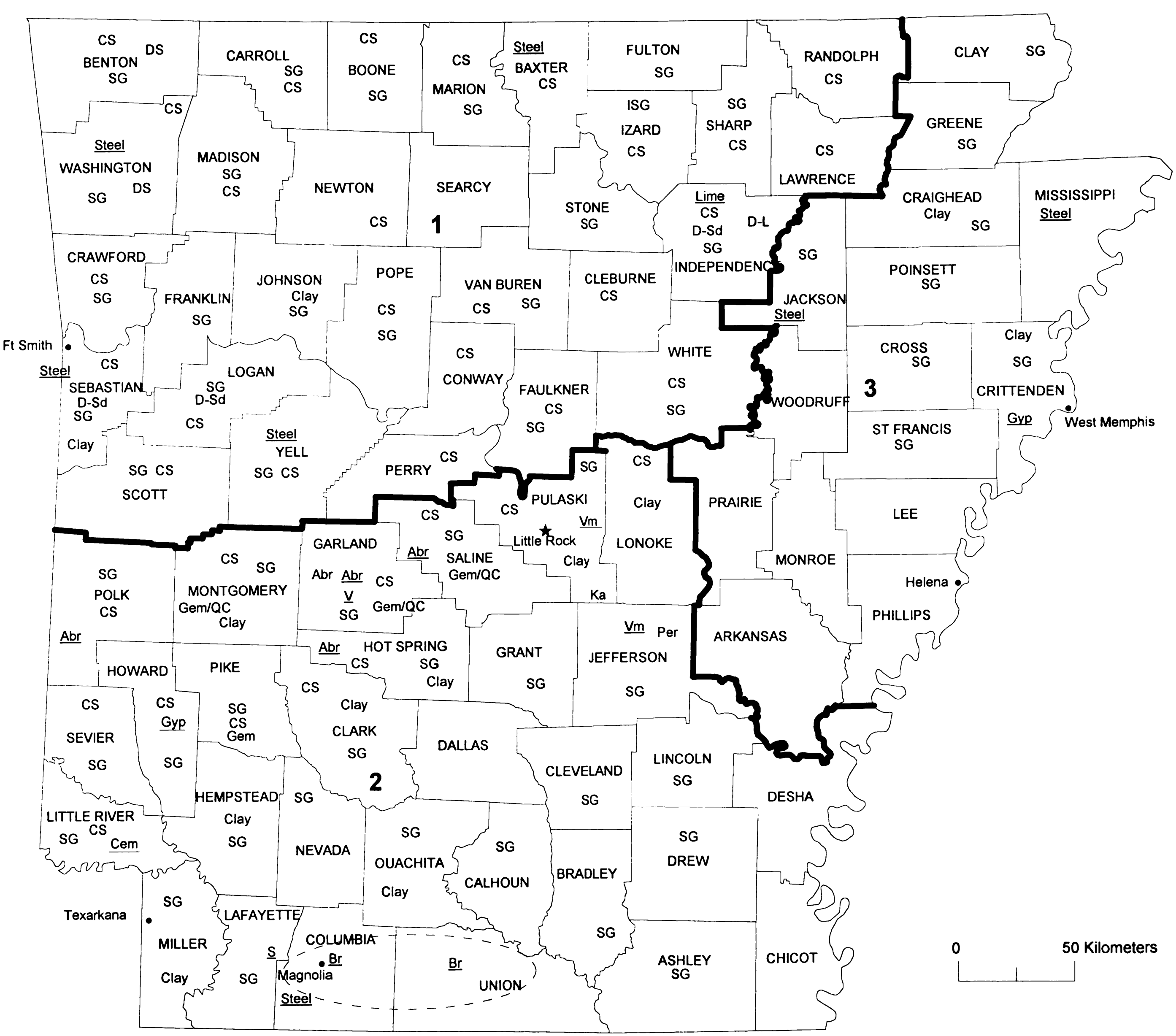
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration, railroad ballast, and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

ARKANSAS



LEGEND

———	County boundary
★	Capital
•	City
1 ▬	Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Abr	Abrasives
Abr	Abrasives plant
Br	Bromine plant
Clay	Common clay
Cem	Cement plant
CS	Crushed stone
DS	Dimension stone
D-Sd	Dimension sandstone
D-L	Dimension limestone
Gem	Gemstones
Gem/QC	Quartz crystal
Gyp	Gypsum plant
ISG	Industrial sand and gravel
Ka	Kaolin
Lime	Lime plant
Per	Perlite
S	Sulfur plant
SG	Construction sand and gravel
Steel	Steel plant
V	Vanadium plant
Vm	Vermiculite plant
◌	Concentration of mineral operations

Source: Arkansas Geological Commission/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF ARKANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Arkansas Geological Commission for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Arkansas was $520 million, according to the U.S. Geological Survey (USGS). This was a more than 7% increase from that of 1998,[2] following a marginal decrease from 1997 to 1998. The State climbed in rank in 1999 to 28th from 30th among the 50 States in total nonfuel mineral production value, of which Arkansas accounted for more than 1% of the U.S. total.

In 1999, the rise in Arkansas' nonfuel mineral value was mainly attributable to a substantial increase in the value of bromine, the State's leading nonfuel mineral, based on value. All other mineral commodities had relatively small increases, except for construction sand and gravel and common clay, which showed similarly small decreases (table 1). In 1998, the largest portion of Arkansas' decrease in value resulted from a significant drop in the value of bromine. Much of this decrease was made up by increases in crushed stone and construction sand and gravel values (table 1).

Based upon USGS estimates of quantities produced during 1999, Arkansas continued to be the leading bromine-producing State, accounting for most U.S. production. Michigan was the only other State that produced bromine. Mining operations in both States extracted subsurface, bromine-rich natural brines by submersible pump for subsequent processing. Arkansas also remained first among three States that produce silica stone; third of four tripoli-producing States; fourth in kaolin; and eighth in common clay. By value, Arkansas rose to fourth from sixth in the Nation in the production of gemstones. Additionally, significant quantities of crude gypsum, construction and industrial sand and gravel, crushed stone, and dimension stone were produced in the State. The State's metal production, mostly that of raw steel, resulted from materials received from other domestic and foreign sources.

The Arkansas Geological Commission[3] (AGC) provided the following narrative information. No bauxite was mined, but Alcoa Inc.'s plant in Saline County used previously mined and stockpiled bauxite for the production of propants used by the oil industry in formation fracturing procedures.

Brominated flame retardants are used in epoxies, phenolics, acrylonitrile-butadiene-styrene, polystyrene, polycarbonates, and unsaturated polyesters. In September 1999, Albemarle Corp. announced the completion and startup of a 50,000-metric-ton-per-year production facility for tetrabromobisphenol-A (TBBPA), a flame retardant. The plant is located near Magnolia in Columbia County. The plant uses new, continuous-process technology to produce TBBPA (SAYTEX CP-2000). Great Lakes Chemical Co. remained active at its plant and bromine extraction operations in Union County near El Dorado.

Umetco, Inc. initiated reclamation of the Wilson Springs mines area in Garland County in late 1997, and continued this effort throughout 1998 and 1999. Strategic Minerals Corp. continues operation of the mill facility based on out-of-State vanadium-bearing feed.

Ash Grove Cement Co. operates the Rocky Point plant in Little River County. Both chalk from the Annona Chalk and silica from the Marlbrook Marl are used as source materials.

Star Resources Corp. of Houston, TX, leased potential diamond-bearing properties immediately northeast of the Crater of Diamonds State Park in Pike County. It announced that it recovered 10 carats of diamonds per metric ton of material sampled in a 100-metric-ton (t) test in 1999, and planned to continue exploration efforts, including large-bore drilling during 2000.

On June 9, 1998, the new Federal Transportation Equity Act for the 21st Century (TEA-21) was signed into law. TEA-21 has dramatically increased exploration and acquisitions activity in Arkansas' aggregate industry in both 1998 and 1999.

Arkhola Sand and Gravel Co. explored for additional quarry sites in several formations in the western portion of the Arkansas River Valley. Bennett Brothers Stone Co., Inc., obtained rough fieldstone, dimension stone, and other building stone materials from deposits in Garland County and nearby counties. Bobby Plant Asphalt Co., based in Murfreesboro, Pike County, is in the development and early production phase of a major quarry in the Jackfork Sandstone south of Kirby in central Pike County.

Chrisman Construction Co. is actively quarrying and crushing aggregate in Johnson and Logan Counties. Duffield Stone and Gravel Co. completed its first full year of operation of the Gumlog Quarry in upper Atoka Sandstone in Pope County, and is proceeding with further exploration in the region. McClinton-Anchor, Inc. explored for new aggregate quarry sites; it examined limestones in the Ozarks Plateau region of northwest Arkansas.

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[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] J. Michael Howard, Geology Supervisor, authored the text of State minerals information provided by the Arkansas Geological Commission.

Granite Mountain quarries is producing aggregate from the Atoka Formation in southern Scott County and from nepheline syenite at its two quarries in Pulaski County. It also acquired potential aggregate-producing property in Saline County, Hot Spring County, and in the western portion of the Arkansas Valley. Martin Marietta Co. operated at the Hatton Quarry in southern Polk County and at its 270 Quarry near Magnet Cove in Hot Spring County. During 1999, on property adjacent to the 270 Quarry, the company built a new asphalt hot-mix plant.

Minnesota Mining and Manufacturing Co. mined rock (nepheline syenite) from the Big Rock Arch Street Pike Quarry to supply its roofing granule plant in Sweet Home, Pulaski County. Additional rock was being taken from this quarry by Martin Marietta Co. for aggregate. Provo Co., TX, was sporadically processing dump material from the HMB Quarry in the Jackfork Sandstone in Sevier County. Pyramid Stone Co. quarried and crushed stone from sandstone quarries near Greenbrier, Faulkner County, and near Centerville, Yell County.

Rogers Group, Inc. continued with exploration of sandstone quarries in the upper and middle Atoka at Toad Suck in eastern Perry County, north of Greenbrier, and at Beryl in Faulkner County. Rogers Group was producing crushed stone for aggregates and fill material from the Tidwell Quarry in the Arkansas Novaculite formation in northeast Hot Spring County, and was investigating its potential as a high-silica resource for ferrosilicon use. It also produced aggregate from the Jackfork Sandstone of the DeRoche Quarry, but moved its asphalt plant from this site to the Tidwell Quarry at Glen Rose.

Schwartz Stone Co. was quarrying sandstone from the Hartshorne Sandstone for use as crushed aggregate and dimension stone from a site north of Midway in Logan County. The Souter Construction Co. produced riprap from the Hollywood Quarry in Clark County. The Hollywood Quarry is owned by Pine Bluff Sand and Gravel Co. Texas Industries Group evaluated deposits of tuff on leased property in southern Polk County.

Vulcan Materials Co. of Birmingham, AL, tested aggregate from the upper Morrowan Sandstone at a quarry operation at Judsonia in White County. Vulcan was also producing dolomitic limestone from lower Ordovician-age rocks near Black Rock in Lawrence County. The company actively processed rock from the L & R Quarry in middle Atoka Sandstone near Floyd in White County. Vulcan acquired Rock Products, Inc. and has been exploring the potential of rock aggregate resources in Morrowan- and Atokan-age sandstones in Cleburne and White Counties. Charles Weaver Co. was developing a quarry and crushing facility in the middle Atoka Formation near El Paso in White County.

There continues to be a major use of rock from about 30 privately operated quarries on paper company lands (Weyerhauser Corp. and International Paper Co.). The crushed rock is used in the numerous company-constructed timber access roads on their lands. Most counties in the Paleozoic region (northwestern portion of the State) have their own county quarries. The materials from these quarry operations are used by the counties as aggregate and road fill. Several major communities also have large quarry operations that supply crushed stone and fill material.

The James Hardie Gypsum Co. became the world's largest wallboard producer (from gypsum) in the fall of 1999 with the completion of a $60 million expansion to the former Briar Plant operation near Nashville in Howard County. Annual production is expected to be 130 million square meters (Mm^2) of wallboard. Production in 1999 was 895,000 t of raw gypsum from which 97 Mm^2 of wallboard was manufactured. The plant and mine employ about 450 people. Principal markets for the company's product are in Alabama, Kentucky, Mississippi, and Indiana.

C.W. (Bill) Harrison Gypsum Co. of Oklahoma ceased gypsum-mining operations north of Highland, Pike County, in the summer of 1999. Reclamation of the mine began in 1999 and continued through the end of the year.

Arkansas' only lime plant, near Batesville in Independence County, is owned by Arkansas Lime Co. The company was producing high-calcium quicklime and high-calcium hydrated lime, from the Boone Formation. The quarry is about three kilometers east of its secondary crusher and kiln operation. After primary crushing, the ore is hand sorted and transported to the calcining plant by narrow-gauge rail.

The Butterfield Quarry in Hot Spring County is managed and operated by the Clovis Wallis Whetstones, Inc. for high-purity silica applications. Clovis Wallis Whetstones, Inc., also sporadically crushed novaculite for high-silica demands at a site south of Lonsdale near the Saline-Hot Spring County line. The Rogers Group evaluated high-silica novaculite in the Ouachita Mountains for potential use in the ferrosilicon and silicon markets.

The four largest whetstone operators in the State actively manufactured novaculite-based products. Norton Abrasive Co. and Smith's Abrasives, Inc. lead the way. The relatively new Norton plant in southern Garland County affords better continuity of operations than the previous procedure of shipping the raw rock out-of-State. Hall's Whetstones Inc. expanded activities and markets, principally for novaculite products. Dan's Whetstone Co., Inc. produced whetstone-grade novaculite from its mine in Garland County. Sales increased somewhat for whetstone products in 1999 over 1998. Dan's Whetstone produces four grades of honestones: soft or medium, hard, translucent, and black.

Peyton Creek Minerals, based in Dallas, TX, conducted investigations for phosphate at one site in northern Van Buren County.

There were approximately 100 active sand and gravel operations in Arkansas in 1999, the greatest number of these being in the southeastern portion of the State (the Gulf Coastal Plain). For 1999, 15 sand and gravel permits were issued by the Arkansas Department of Environmental Quality (ADEQ). The permits were issued to: Guy King and Sons (2 sites), Mountain Home Concrete (2 sites), D & D Hauling, all in Marion County; Lindsey Construction, Charlton Construction, Rogers Sand and Gravel, and Riverview Farms, in Washington County; Carter Sand and Gravel in Craighead County; Ouachita Builders, Inc. in Montgomery County; C.J. Horner Co. in Clark County; J.T. Dozer, Inc., in Sevier County; APAC Tennessee Inc. in Cross County; Hanson Aggregates in Nevada County; Meridian Aggregates Co. in Calhoun County; and Carroll County Stone. One clay permit was issued to Acme Brick Co., formerly Eureka Brick and

Tile Co., in Johnson County. Five notifications of Intent to Quarry were received by ADEQ: McGeorge Contracting Co., Inc. in Sebastian County; Journagan Construction Company in Madison County; Vulcan Materials in Newton County; APAC Arkansas, Inc. in Benton County; and Jet Materials in Randolph County.

Lascas Products, Inc., ceased silica operations at its facility near Jessieville, Garland County in 1998, and has put its plant up for sale. A private citizen of Jessieville, Garland County, produced an undisclosed amount of lascas.

Malvern Minerals Co. actively mined tripoli from a deposit in the upper Arkansas Novaculite in eastern Garland County. Some tripoli was obtained from the Bigfork Chert in a county-operated quarry in western Saline County.

The AGC published the fourth in the agency's series on geology. Articles pertaining to rock aggregate, exploration at the Crater of Diamonds State Park, and a bibliographic listing of all geologic literature published by the State since 1856 are included in this publication. The study of the relationship between the various geologic units being quarried in the Paleozoic region of Arkansas and certain engineering properties of the rock (principally the Los Angeles abrasion and sodium sulfate soundness tests) has been in great demand by the rock aggregate industry within the State.

In 1999, five geologic maps on a 7.5-minute topographic base of southwestern Arkansas were digitized: Delight, Antoine, Pisgah, Piney Grove, and Blevins. The AGC accomplished this work as part of a cooperative effort with the USGS; the USGS STATEMAP program partly funds the project.

The AGC web site (www.state.ar.us/agc/agc.htm) hosted approximately 4,900 visitors during 1999. Information posted on the web pages includes resource data, publications and ordering information, stratigraphic data, geology of Arkansas, Arkansas Board of Registration for Professional Geologists, and agency services. The AGC links page provides a complete link listing of all State Geological Surveys, along with many Federal and Arkansas Government links. There is also an extensive list of links to active geological web sites, organizations, and universities.

The ADEQ issued two partial and two full land releases during 1999 to the following companies: Baker Hughes INTEQ, partial release of 21 hectares (ha) in Montgomery County; James Hardie Gypsum, partial release of 26 ha in Hempstead County; Holland Gravel Company, full release of 11 ha in Saline County; and Harshaw Chemical Company, full release of 5 ha in Pulaski County.

The U.S. Forest Service had 105 contracts from which operators produced about 121,000 t of building stone, rip-rap, and aggregate-related materials (shale and chert), generating about $32,000 in revenue for the Federal Government from the three National Forests in Arkansas—the Ouachita, the Ozark, and the St. Francis. Annual hard-rock lease payments on the Ouachita National Forest are estimated at $10,000.

Operators of 24 quartz contracts and 5 leases with the U.S. Forest Service on the Ouachita National Forest in Arkansas generated about $21,000 in revenue. About 50 t of quartz was removed from quartz mines on the National Forest. Gas lease revenues were approximately $500,000 for the Ozark National Forest and $170,000 for the Ouachita National Forest in 1999.

Work was progressing in 1999 towards publication of the U.S. Forest Service's Ouachita-Ozark Highlands Assessment study that is scheduled for release in early 2000. The major product will be a report on various aspects of the national forests in this region (the Ozark National Forest, the Ouachita National Forest, and the Mark Twain National Forest). The report will include a summary of the mineral data for the assessment region. The individual State-based data reports will be on an accompanying CD-ROM. This is the fact-finding report upon which to base policy decisions for the next 10 to 15 years.

During the 1999 legislative session several changes were made to the Arkansas Open-Cut Land Reclamation Act (Arkansas Code Annotated 15-57-301 to 15-57-321). The major change involved the removal of the term overburden from the definition of open-cut mining. This will allow the Surface Mining and Reclamation Division of the ADEQ to regulate several surface mining operations that were exempt from the law previously. Another change lowered the civil penalty amount that the Department could assess for violations of the law and regulations.

During 1999, the Arkansas Pollution Control and Ecology Commission initiated changes to Regulation No. 15 of the Arkansas Open-Cut Mining and Land Reclamation Code. The changes proposed by the commission were based on recommendations by a special subcommittee that looked into the mining practices on Crooked Creek, which is located in the north-central part of the State. Crooked Creek had been extensively mined for gravel over the past 25 years at the same time that it has become known nationwide as an excellent small-mouth bass fishery. The commission evoked its emergency rulemaking authority twice to make draft versions of the new regulation effective. The last emergency rulemaking was passed on December 3, 1999, and will be in effect for 180 days, after which the commission must have fully promulgated the new regulation, otherwise the original 1996 version will be reinstated.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ARKANSAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

		1997		1998		1999 p/	
Mineral		Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common		979	1,400	995	1,370	1,000	1,340
Gemstones		NA	980	NA	912	NA	950
Sand and gravel: Construction		10,600	48,100	12,100	55,400	11,500	53,900
Silica stone 3/	metric tons	424	2,540	404	3,400	NA	NA
Stone: Crushed		28,100	167,000	35,700	180,000	34,900	181,000
Combined values of bromine, cement, clays (kaolin), gypsum (crude), lime, sand and gravel (industrial), stone (dimension limestone, marble, and sandstone), tripoli		XX	267,000	XX	242,000	XX	283,000
Total		XX	487,000	XX	484,000	XX	520,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 2
ARKANSAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	25	8,560 r/	$42,700 r/	$5.00	24	13,300	$61,900	$4.67
Dolomite	2	W	W	4.02	2	W	W	4.54
Granite	6	10,000	77,200	7.69	6	12,300	64,100	5.21
Sandstone	16	6,520 r/	33,600 r/	5.16 r/	16	6,530	36,500	5.59
Quartzite and quartz	1	W	W	5.25 r/	4	W	W	5.51
Slate	--	--	--	--	1	W	W	4.88
Miscellaneous stone	1	W	W	4.71	8	107	583	5.45
Total or average	XX	28,100	167,000	5.94	XX	35,700	180,000	5.05

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	1,080	$4,940	$4.58
Filter stone	79	375	4.75
Other coarse aggregate	953	4,530	4.76
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,310	6,240	4.78
Bituminous aggregate, coarse	1,180	6,900	5.82
Bituminous surface-treatment aggregate	296	1,670	5.64
Railroad ballast	310	2,200	7.08
Other graded coarse aggregate	W	W	5.59
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	3	29	9.79
Screening, undesignated	632	2,620	4.14
Other fine aggregate	W	W	4.83
Coarse and fine aggregates:			
Graded road base or subbase	4,750	21,100	4.44
Unpaved road surfacing	82	272	3.32
Crusher run or fill or waste	250	1,140	4.54
Other coarse and fine aggregates	W	W	4.81
Other construction materials	W	W	4.82
Agricultural:			
Agricultural limestone	145	918	6.33
Other agricultural uses	W	W	14.30
Chemical and metallurgical:			
Cement manufacture	W	W	3.31
Lime manufacture	W	W	W
Special:			
Other fillers or extenders	W	W	6.09
Roofing granules	W	W	3.31
Other miscellaneous uses: Abrasives	W	W	4.16
Unspecified: 3/			
Actual	9,020	49,700	5.51
Estimated	7,170	39,500	5.51
Total or average	35,700	180,000	5.05

W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, miscellaneous stone, quartzite and quartz, sandstone, and slate.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
ARKANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 ½ inch) 3/	351	1,720	W	W	W	W	--	--
Coarse aggregate, graded 4/	2,900	14,600	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	509	2,190	W	W	W	W	--	--
Coarse and fine aggregate 6/	4,720	19,700	W	W	W	W	--	--
Other construction materials	(7/)	(7/)	4,610	21,700	127	1,130	--	--
Agricultural 8/	160	1,130	--	--	--	--	--	--
Chemical and metallurgical 9/	(7/)	(7/)	(7/)	(7/)	(7/)	(7/)	--	--
Special 10/	--	--	(7/)	(7/)	(7/)	(7/)	--	--
Other miscellaneous uses	(7/)	(7/)	1	4	--	--	--	--
Unspecified: 11/								
Actual	4,170	23,000	4,860	26,800	(7/)	(7/)	--	--
Estimated	2,300	12,600	4,870	26,800	--	--	4,660	23,600
Total	15,200	75,500	15,700	79,900	127	1,130	4,660	23,600

W Withheld to avoid disclosing company proprietary data, included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, granite, limestone, miscellaneous stone, quartzite and quartz, sandstone, and slate.

3/ Includes riprap and jetty stone, and filter stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface treatment aggregate, and railroad ballast.

5/ Includes stone sand (bituminous mix or seal) and screening (undesignated).

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and roofing granules.

7/ Withheld to avoid disclosing company proprietary data, included in "Total."

8/ Includes agricultural limestone and other agricultural uses.

9/ Includes cement manufacture and lime manufacture.

10/ Includes other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	4,730	$25,000	$5.27
Asphaltic concrete aggregates and other bituminous mixtures	1,700	9,400	5.55
Road base and coverings	433	990	2.29
Other miscellaneous uses 3/	589	2,570	4.36
Unspecified: 4/			
Actual	2,480	8,130	3.28
Estimated	2,150	9,330	4.33
Total or average	12,100	55,400	4.58

1/ Data are rounded to no more than three significant digits, may not add to totals shown.

2/ Includes plaster and gunite.

3/ Includes fill, and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
ARKANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	498	2,780	3,220	16,600	1,010	5,530
Asphaltic concrete aggregates and road base materials	120	315	1,720	8,080	290	2,000
Other miscellaneous uses 3/	64	323	487	2,180	39	70
Unspecified: 4/						
Actual	2,170	6,750	122	541	181	837
Estimated	365	1,520	1,130	4,740	662	3,070
Total	3,220	11,700	6,670	32,200	2,190	11,500

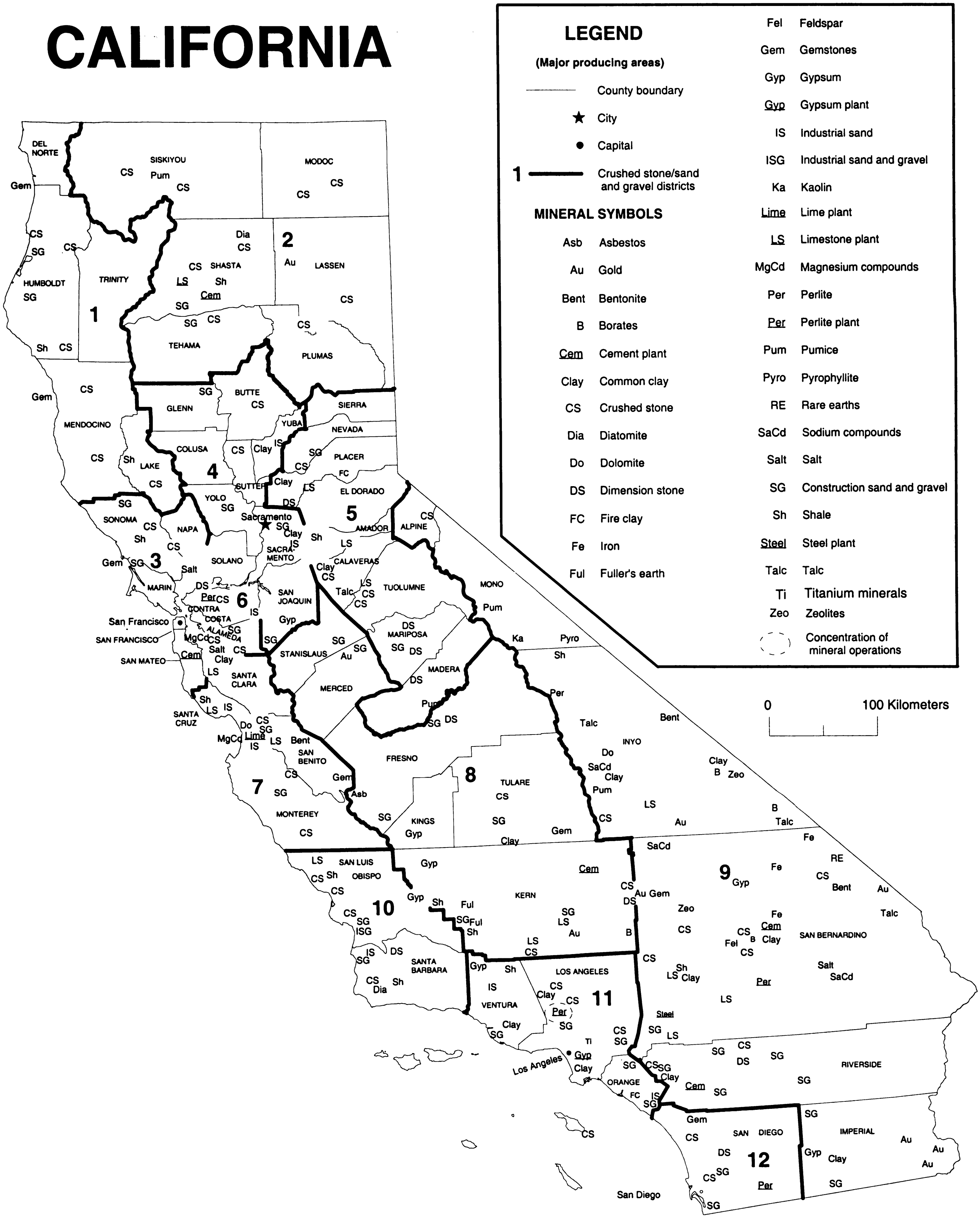
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill, and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

CALIFORNIA



Source: California Department of Conservation, Division of Mines and Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF CALIFORNIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the California Department of Conservation, Division of Mines and Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for California was $3.18 billion, according to the U.S. Geological Survey (USGS). This was a 6% increase from that of 1998,[2] and followed a 1.3% decrease in 1998 from 1997. The State rose in rank to first in the Nation (third in 1998) in total nonfuel mineral production value, of which California accounted for more than 8% of the U.S. total.

Industrial minerals accounted for more than 95% of California's nonfuel mineral value; the remaining value mostly resulted from the mining of gold and silver. Construction sand and gravel, portland cement, boron minerals, and crushed stone, in descending order of value, were the leading industrial minerals in 1999, accounting for more than 79% of the State's total industrial mineral value. Most of the State's nonfuel mineral commodities increased in value, led by a $105 million increase in construction sand and gravel and a more than $70 million rise in the value of soda ash. These were followed by portland cement, up $19 million (estimated); boron, up $12 million; and crushed stone, up $9 million. Smaller, yet significant increases took place in diatomite, feldspar, and salt. The only substantial decreases were those of gold and magnesium compounds. In 1998, significant increases in the values of construction sand and gravel (up $133 million), portland and masonry cements (up an estimated $67.1 million), crushed stone (up $19 million), and magnesium compounds (up about $2 million) were more than offset by the decreases of four mineral commodities. The largest decreases were those of boron, down $94 million, and gold, down $81 million, followed by rare-earth metal concentrates, soda ash, salt, diatomite, and lime (in descending order of change). All other changes in value were on the order of $1 million or less (table 1).

Based upon USGS estimates of the quantities produced in the United States during 1999, California continued as the Nation's only State to produce boron, rare-earth metal concentrates, and asbestos (in descending order of value or rank). The State remained first in the production of construction sand and gravel and portland cement, and first among four States that produced diatomite. California continued to be second of two States that produced soda ash; second in magnesium compounds and pumice and pumicite; third in masonry cement and feldspar, and third among three States that produce titanium (ilmenite); fourth in fire clay; fifth in fuller's earth, crude gypsum, and kaolin; sixth in fuller's earth and talc; eighth in bentonite; and ninth in common clay and silver. California rose in rank to 4th from 6th in industrial sand and gravel, but dropped to 3d from 2d in gold; to 4th from 3d in crude perlite; to 5th from 3d in gemstones; and to 10th from 8th in salt. Additionally, significant quantities of crushed stone and dimension stone were produced in the State.

The following narrative information was provided by the California Department of Conservation, Division of Mines and Geology (DMG).[3] Newmont Gold Co.'s Mesquite Mine (Imperial County) continued to lead the State in gold production for the year. Homestake's McLaughlin Mine (Napa, Lake, and Yolo Counties) was the second largest gold producer in the State, followed by Viceroy Gold Corp.'s Castle Mountain Mine (San Bernardino County).

Homestake Mining Co. celebrated the pouring of its 3 millionth ounce (93 metric tons) of gold in February 1999 at its McLaughlin Mine. The mine surpassed its initial gold production projection of 90 metric tons (t), made in 1985 when the mine opened. Mining operations ceased in 1996, but gold processing is expected to continue until late 2002. The McLaughlin gold mine was a major gold producer in California since 1985.

Avocet Tungsten, Inc. considered various options for its plant in Bishop, CA, Inyo County—closing its plant, selling it, or forming a joint venture. During much of 1999, the plant continued to draw down on inventories. No mining has taken place since the mine closed in 1990.

Other metallic minerals produced in the State include silver, iron, and ilmenite (a titanium mineral). All of the iron produced in 1999 was used in the production of portland cement. All silver produced was a byproduct of gold production. Ilmenite was recovered as a byproduct from processing sand and gravel.

Glamis Imperial Corp., a subsidiary of Glamis Gold Inc., continued the permitting process for its proposed Imperial Gold Mining Project (Imperial County). The project has identified approximately 86 million metric tons (Mt) of gold ore with an average grade of 0.55 grams per metric ton.

Mono County Mining Co., a wholly owned subsidiary of Royal Gold Inc., continued exploration through the year at its Inyo Gold Project (Inyo County). Exploration included the location of nine new mining claims. The company has not yet filed for any mining or reclamation permits. Mono County Mining Co. was formerly known as Royal Long Valley, Inc.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Susan Kohler, Associate Geologist, authored the text of information submitted by the Division of Mines and Geology.

The Golden Queen Mining Co. Ltd. completed a 77-hole drilling program consisting of 9,800 meters of drilling in July at its Soledad Mountain Project (Kern County). Based upon this new drilling data, the company is upgrading its resources. Reserves determined in 1998 amounted to 75 t of gold and 123 t of silver. The company is waiting to initiate construction upon stabilization of the gold price at $325 per troy ounce.

Construction sand and gravel continued to be California's leading industrial mineral commodity with Vulcan Materials Co./CalMat Division's Sun Valley operation (Los Angeles County) leading the State and the Nation in sand and gravel production.

Calaveras Materials Inc.'s 184-hectare (ha) proposed sand and gravel project along the Kings River was approved by Fresno County in December. The approval comes with the stipulation that the company will fund nearby road improvements at a total cost of $8.2 million. The improvements are expected to be completed by the end of 2001. The project will provide 36 Mt of aggregate reserves to the Fresno area.

Teichert Aggregates continued its permitting process for the Lincoln project, a 290-ha aggregate site located about 6 kilometers north of the town of Lincoln (Placer County). The project calls for the extraction of 34 Mt of construction alluvial sand and gravel and 109 Mt of crushed granite aggregate over a period of 85 years.

Kaweah River Rock Co. was denied an expansion permit in June to mine 330 ha of land located on the Hanna Ranch near Woodlake (Tulare County). The expansion would have extended the company's existing mining operation for an additional 40 years and would have provided approximately 27 Mt of aggregate reserves to the Visalia area.

Transit Mix Concrete Company, a division of Southdown Inc., released a draft environmental impact report for its proposed Soledad Canyon sand and gravel mining project (Los Angeles County). If approved, approximately 51 Mt of construction-grade aggregate material will be mined from a 186-ha site over a period of 20 years. The project will also include a concrete batch plant.

The William J. Clark Co. was ordered in February to shut down its sand and gravel mine located along the Arroyo Seco River (Monterey County) due to permit disputes. The rock plant operator, Granite Construction Co., is applying for an expanded mining permit.

Molycorp Inc.'s world class Mountain Pass rare-earths mine (San Bernardino County) resumed mining and milling of ore for a 3-month period starting in December 1999. The milled ore is expected to keep the plant in operation in a limited capacity through the year 2000. Molycorp is obtaining a permit to expand its operation, which will include enlargement of the current pit and an on-site tailings pond. The Mountain Pass Mine is the only producer of rare earths in the United States.

U.S. Borax Inc., a division of Rio Tinto Ltd., in May announced its acquisition of Lake Minerals Corp.'s Trona Mine (Inyo County). The operation has been renamed U.S. Borax Inc. Owens Lake Operation. Trona (a double salt of sodium carbonate and sodium bicarbonate) is used for borate refining, as a cattle feed supplement, and as a raw material to make soda ash. The newly acquired trona deposit, located on Owens Lake, is the third largest in the United States and will provide an excellent source of trona during the 40-year lifespan of U.S. Borax Inc.'s Kramer boron mine in Kern County, California's largest open pit mine.

Hanson PLC acquired the two largest producers of marine-dredged aggregate in the San Francisco Bay—Tidewater Sand and Gravel Inc. and Olin Jones Sand Co. and Jones Sand Co. (collectively "Jones"). Both operations produce construction-grade sand and high-quality fill sand. Hanson PLC also acquired Nelson Sloan Co., a sand and gravel company based in the San Diego area.

In January, Hanson PLC announced that all of its California holdings would officially be given the Hanson name. The London-based company currently owns about 20 aggregate companies throughout the State.

Assembly Bill 297 was signed by the Governor in October. The bill allows for a resource management plan (RMP) to serve as the equivalent of a reclamation plan for aggregate operations along Cache Creek (Yolo County). The Surface Mining and Reclamation Act (SMARA) of 1975 requires California mining operations to have an approved reclamation plan. The law also provides for a task force to review SMARA requirements and to recommend any revisions that may be necessary for area-specific RMP's in lieu of reclamation plans.

The International Agency for Research on Cancer upgraded crystalline silica to its highest carcinogenic classification, as listed in California's Safe Drinking and Toxic Enforcement Act. Consequently, most California aggregate producers are now required to warn employees, consumers, and neighbors of potential health hazards linked to crystalline silica.

With the passage of the Federal Transportation Equity Act in 1998 (TEA-21), California could receive more than $20 billion through the year 2004. With most of these funds (about $15 billion) being spent on highways, California is gearing up for a large increase in aggregate production. One of the first projects scheduled to begin in the year 2000 is a repaving of Interstate 80 from Auburn east to the Nevada border. The project is expected to cost about $500 million.

Siting and permitting of mine operations throughout the State continue to be locally controversial. The leading issues include intense land use competition; wide ranging environmental concerns; surface water and groundwater issues; as well as noise, dust, and truck-traffic in populated areas. The California Department of Conservation's DMG Mineral Land Classification Project (a mandate of SMARA) continues to provide lead agencies with mineral resource maps that have proven to be of great value in land use planning and mineral conservation. In 1999, DMG completed mineral land classification reports of aggregate resources in Monterey, San Benito, Santa Clara, Santa Cruz, Sacramento, and Merced Counties. During 1999, classification projects were ongoing in El Dorado, Kern, Tehama, and Lassen Counties.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CALIFORNIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Asbestos	metric tons	6,890	W	5,760	W	W	W
Boron minerals		604 3/	580,000	1,170	486,000	657	498,000
Cement:							
Masonry		169	13,500 e/	410	39,600 e/	420	41,000 e/
Portland		10,300	705,000 e/	10,000	746,000 e/	10,300	765,000 e/
Clays:							
Bentonite		29	3,420	29	2,700	31	2,480
Common		937	10,300	918	9,610	923	9,370
Kaolin		75	W	W	W	W	W
Gemstones		NA	1,330	NA	1,810	NA	899
Gold 4/	kilograms	24,200	258,000	18,700	177,000	16,600	149,000
Lime		200	20,300	185	18,100	W	W
Rare-earth metal concentrates	metric tons	20,000 e/	W	5,000 e/	14,400 e/	5,000 e/	14,400 e/
Sand and gravel:							
Construction		115,000	668,000	135,000	801,000	150,000	906,000
Industrial		1,920	44,900	1,740	40,400	1,820	41,500
Silver 4/	metric tons	23	3,630	11	1,860	8	1,340
Stone:							
Crushed		49,600	325,000	55,100	344,000	55,000	353,000
Dimension	metric tons	26,200	4,300	28,500	4,710	26,500	4,790
Zeolites	do.	--	--	(5/)	NA	--	--
Combined values of clays (fire, fuller's earth), diatomite, feldspar, gypsum (crude), iron ore (usable), magnesium compounds, mercury (1997), perlite (crude), potash (1997), pumice and pumicite, salt, soda ash, sodium sulfate [natural, (1997-98)], talc and pyrophyllite, titanium concentrates (ilmenite), and values indicated by symbol W		XX	401,000	XX	318,000	XX	391,000
Total		XX	3,040,000	XX	3,000,000	XX	3,180,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data.
XX Not applicable. -- Zero.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Weight reported as B_2O_3 and is not comparable to prior years.

4/ Recoverable content of ores, etc.

5/ Withheld to avoid disclosing company proprietary data.

TABLE 2
CALIFORNIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	23 r/	22,900	$131,000	$5.73	28	24,800	$149,000	$6.01
Dolomite	7 r/	270 r/	2,740 r/	10.16 r/	6	252	1,060	4.21
Granite	20 r/	9,640 r/	72,200 r/	7.48 r/	23	10,400	51,500	4.95
Marble	2	W	W	7.10 r/	2	W	W	8.27
Sandstone and quartzite	8 r/	2,500 r/	21,000 r/	8.39 r/	9	2,810	25,900	9.23
Shell	1	W	W	7.86 r/	1	W	W	7.86
Traprock	21 r/	9,590 r/	66,100 r/	6.90	21	9,740	74,400	7.64
Slate	2	W	W	39.17 r/	3	W	W	21.85
Volcanic cinder and scoria	3	483 r/	3,450	7.14 r/	10	538	3,370	6.26
Miscellaneous stone	13 r/	3,840 r/	25,300 r/	6.59 r/	35	6,190	35,000	5.65
Total or average	XX	49,600	325,000	6.56	XX	55,100	344,000	6.24

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	190	$3,090	$16.28
Riprap and jetty stone	1,820	16,400	8.99
Filter stone	463	3,140	6.78
Other coarse aggregate	126	874	6.94
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,030	11,200	5.49
Bituminous aggregate, coarse	2,000	16,500	8.27
Bituminous surface-treatment aggregate	W	W	14.50
Railroad ballast	531	3,840	7.24
Other graded coarse aggregate	481	4,180	8.69
Fine aggregate (-3/8 inch):			
Stone sand, concrete	531	2,710	5.11
Stone sand, bituminous mix or seal	1,080	4,320	4.02
Screening, undesignated	754	3,450	4.57
Other fine aggregate	108	415	3.85
Coarse and fine aggregates:			
Graded road base or subbase	6,630	39,700	5.99
Unpaved road surfacing	319	2,260	7.10
Terrazzo and exposed aggregate	103	1,210	11.70
Crusher run or fill or waste	1,370	4,840	3.53
Other coarse and fine aggregates	496	4,130	8.33
Other construction materials	1,040	8,850	8.50
Agricultural:			
Agricultural limestone	82	1,020	12.46
Poultry grit and mineral food	112	2,090	18.63
Other agricultural uses	4	14	3.56
Chemical and metallurgical:			
Cement manufacture	11,600	52,500	4.53
Lime manufacture	(3/)	(3/)	11.10
Glass manufacture	(3/)	(3/)	18.40
Sulfur oxide removal	(3/)	(3/)	16.61
Other chemical and metallurgical	15	2,070	13.73
Special:			
Asphalt fillers or extenders	W	W	14.00
Other fillers or extenders	703	23,300	33.07
Roofing granules	29	150	5.20
Other miscellaneous uses:			
Flour (slate)	W	W	46.96
Other specified uses not listed	203	1,950	9.60
Unspecified: 4/			
Actual	4,690	29,000	6.18
Estimated	16,800	91,600	5.44
Total or average	55,100	344,000	6.24

W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone and quartzite, shell, slate, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data, included with "Other chemical and metallurgical."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4

CALIFORNIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	W	W	(3/)	(3/)	243	3,660	269	3,460	487	3,250
Coarse aggregate, graded 4/	--	--	(3/)	(3/)	512	7,080	(3/)	(3/)	(3/)	(3/)
Fine aggregate (-3/8 inch) 5/	--	--	(3/)	(3/)	59	500	(3/)	(3/)	(3/)	(3/)
Coarse and fine aggregate 6/	165	550	(3/)	(3/)	1,520	11,400	(3/)	(3/)	560	3,330
Other construction materials	--	--	357	1,680	313	2,570	2,460	18,900	158	1,070
Agricultural 7/	--	--	W	W	--	--	--	--	--	--
Chemical and metallurgical 8/	W	W	W	W	--	--	--	--	W	W
Special 9/	--	--	--	--	--	--	--	--	W	W
Other miscellaneous uses	W	W	--	--	--	--	--	--	--	--
Unspecified: 10/										
Actual	--	--	--	--	1	6	653	4,510	--	--
Estimated	118	715	W	W	951	5,260	230	1,270	458	2,450
Total	388	1,730	1,270	5,530	3,600	30,500	3,620	28,100	1,770	12,100

	District 6		District 7		District 8		District 9		District 10	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	183	3,030	564	4,460	(3/)	(3/)	W	W	114	877
Coarse aggregate, graded 4/	(3/)	(3/)	3,070	16,500	(3/)	(3/)	370	3,170	--	--
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	W	W	(3/)	(3/)	78	619	W	W
Coarse and fine aggregate 6/	2,060	11,600	2,700	14,600	(3/)	(3/)	63	423	249	852
Other construction materials	1,270	12,600	W	W	583	3,330	W	W	--	--
Agricultural 7/	W	W	W	W	--	--	W	W	W	W
Chemical and metallurgical 8/	--	--	W	W	W	W	6,040	32,100	W	W
Special 9/	--	--	--	--	--	--	703	23,300	W	W
Other miscellaneous uses	--	--	--	--	--	--	W	W	--	--
Unspecified: 10/										
Actual	W	W	473	2,870	W	W	1,110	6,730	77	471
Estimated	1,190	6,650	1,060	5,860	W	W	5,540	30,300	--	--
Total	4,880	35,000	12,500	60,400	6,380	33,800	14,600	102,000	611	4,910

	District 11		District 12		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	(3/)	(3/)	--	--	--	--
Coarse aggregate, graded 4/	(3/)	(3/)	--	--	--	--
Fine aggregate (-3/8 inch) 5/	(3/)	(3/)	--	--	--	--
Coarse and fine aggregate 6/	(3/)	(3/)	--	--	--	--
Other construction materials	200	990	--	--	--	--
Agricultural 7/	--	--	--	--	--	--
Chemical and metallurgical 8/	--	--	--	--	--	--
Special 9/	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--
Unspecified: 10/						
Actual	2,220	13,500	--	--	1	4
Estimated	2,380	11,500	666	4,120	--	--
Total	4,800	25,900	666	4,120	1	4

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Withheld to avoid disclosing company proprietary data, included with "Other construction materials."

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Includes cement manufacture, glass manufacture, lime manufacture, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, other fillers or extenders, and roofing granules.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	26,800	$172,000	$6.43
Plaster and gunite sands	3,230	23,200	7.17
Concrete products (blocks, bricks, pipe, decorative, etc.)	477	4,560	9.56
Asphaltic concrete aggregates and other bituminous mixtures	11,900	85,200	7.14
Road base and coverings 2/	13,300	73,000	5.48
Fill	4,970	20,000	4.03
Snow and ice control	12	29	2.42
Railroad ballast	55	277	5.04
Other miscellaneous uses	685	5,390	7.87
Unspecified: 3/			
Actual	47,900	269,000	5.61
Estimated	25,800	148,000	5.76
Total or average	135,000	801,000	5.93

1/ Data are rounded to no more than three significant digits, may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
CALIFORNIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	324	2,190	266	1,290	539	5,430
Plaster and gunite sands	2	32	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	421	3,270	W	W	W	W
Road base materials 3/	316	2,180	634	2,740	W	W
Fill	120	649	270	745	31	188
Other miscellaneous uses 4/	25	83	--	--	303	2,250
Unspecified: 5/						
Actual	8	30	38	304	412	3,840
Estimated	509	3,680	658	3,640	290	1,860
Total	1,730	12,100	1,960	9,930	1,930	16,300
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	4,640	28,500	933	5,870	2,250	19,700
Plaster and gunite sands	1,930	14,200	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	3,680	26,100	W	W	1,420	12,400
Road base materials 3/	5,700	30,400	1,160	7,170	W	W
Fill	436	1,370	20	93	1,210	7,540
Other miscellaneous uses 4/	59	445	40	380	--	--
Unspecified: 5/						
Actual	630	3,480	W	W	W	W
Estimated	5,710	39,900	1,190	7,370	381	2,630
Total	22,800	144,000	4,120	26,700	12,300	98,200
	District 7		District 8		District 9	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	858	7,490	4,970	28,400	3,220	17,000
Plaster and gunite sands	W	W	123	789	166	732
Asphaltic concrete aggregates and other bituminous mixtures	36	155	1,860	11,600	1,620	12,100
Road base materials 3/	W	W	2,500	13,400	985	3,980
Fill	93	536	340	1,130	231	563
Other miscellaneous uses 4/	--	--	W	W	130	922
Unspecified: 5/						
Actual	W	W	W	W	12,600	61,600
Estimated	599	3,630	1,310	7,960	8,310	39,700
Total	2,850	23,300	12,000	67,800	27,300	137,000
	District 10		District 11		District 12	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	605	3,080	8,450	55,100	238	2,860
Plaster and gunite sands	85	529	511	3,370	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	1,920	12,600	W	W
Road base materials 3/	493	1,280	460	2,480	W	W
Fill	420	1,280	1,720	5,710	78	596
Other miscellaneous uses 4/	W	W	39	326	--	--
Unspecified: 5/						
Actual	104	518	14,900	85,700	7,750	43,500
Estimated	197	1,180	2,120	10,800	4,490	25,800
Total	2,310	10,600	30,100	176,000	12,700	73,500

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

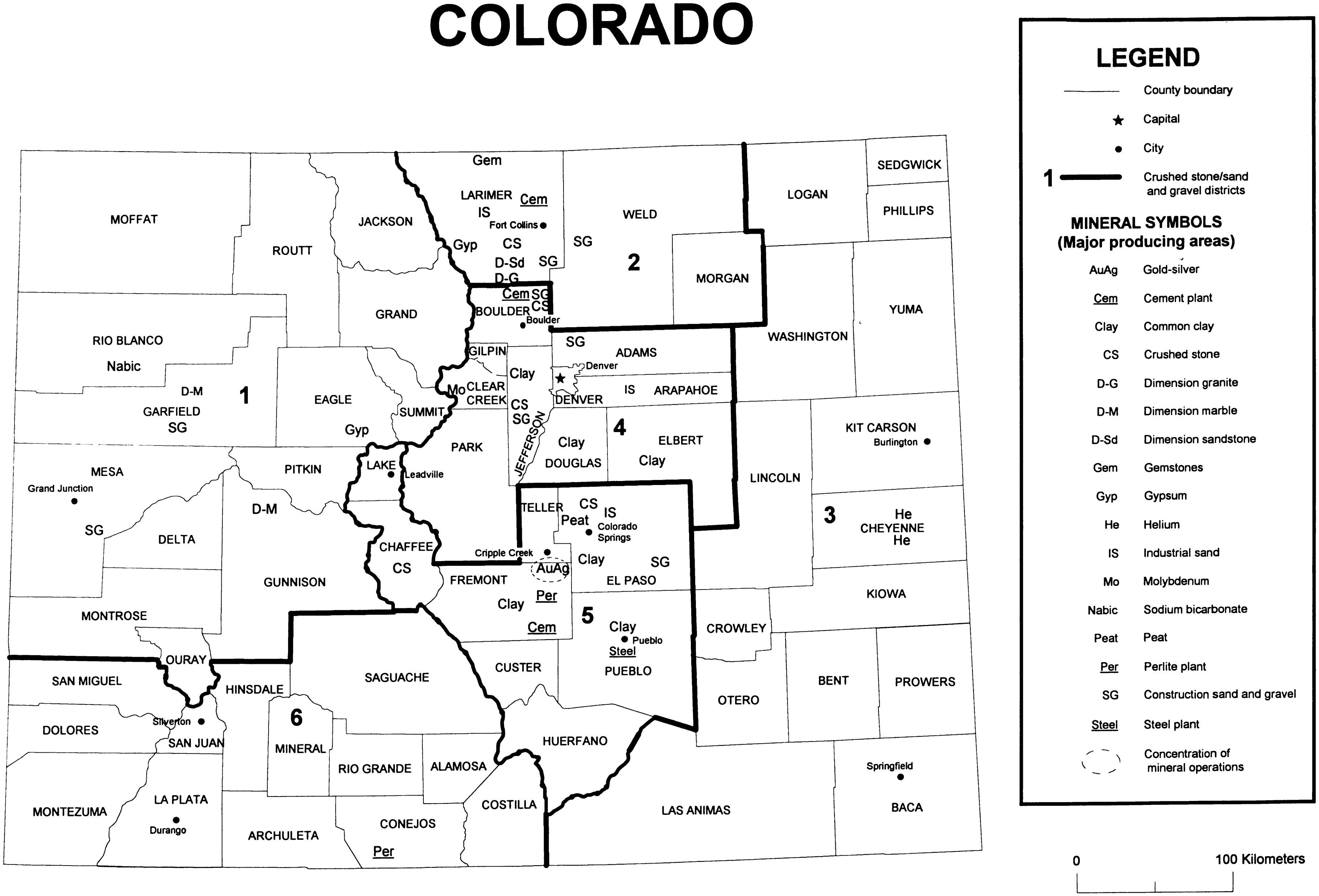
2/ Does not include 3.08 million metric tons valued at $5.1 million from unspecified districts.

3/ Includes road and other stabilization (cement and lime) and snow and ice control.

4/ Includes railroad ballast.

5/ Reported and estimated production without a breakdown by end use.

COLORADO



Source: Colorado Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF COLORADO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Colorado Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Colorado was $555 million, according to the U.S. Geological Survey (USGS). This was about a 3% decrease from that of 1998,[2] following a 9.2% increase from 1997 to 1998. The State decreased in rank to 26th from 24th among the 50 States in total nonfuel mineral production value, of which Colorado accounted for almost 1.5% of the U.S. total.

More than 78% of Colorado's nonfuel mineral production value, up from 72% in 1998, came from industrial minerals, especially construction sand and gravel, portland cement, and crushed stone, the State's three leading nonfuel mineral commodities (in descending order of value). The higher percentage value in 1999 resulted, in part, from the increased production and values for the top three industrial minerals, especially construction sand and gravel. More importantly, the percentage value for metals went down because of reduced production and values. Each metal had at least a small decrease in production, but the significant changes were a 25% decrease in molybdenum production and value and the January 31 closing of the State's only operating zinc/lead mine. ASARCO Incorporated's Leadville unit, the Black Cloud Mine, closed because the mine's resources were depleted. Gold and silver values also decreased, by a combined total of about $7 million, adding to the State's overall drop in nonfuel mineral value. In 1998, a $53-million increase in construction sand and gravel, a $13-million rise in portland cement, and a $3-million increase in crushed stone accounted for most of the significant increase in value for the year. These increases were mitigated somewhat by a $12-million decrease in the value of molybdenum and a more than $8-million drop in the value of gold (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States during 1999, Colorado remained second in molybdenum and seventh in gold. While the State rose to 6th from 8th in construction sand and gravel and tied for 10th (up from 11th) with Kentucky in gemstones, it dropped from 5th to 6th in lead and from 6th to 7th in zinc.

The following narrative information was provided by the Colorado Geological Survey.[3] The Henderson Mine in Clear Creek County, operated by Cyprus Amax Minerals Co., is the Nation's top producer of primary molybdenite. In 1999, the mine and mill produced an estimated 9,500 metric tons (t) of contained molybdenum, down about 30% from the 13,700 t produced in 1998. The Henderson Mine was shut down during August and September for installation of a 16-kilometer (km) conveyor belt from an underground haulage station to a surface transfer station. The conveyor belt replaced the 16-km underground train haulage system, which had been in use since the mine began production in 1976. Also, the mine will be changing its caving process to enable more efficient ore production and installing a new fleet of underground haulage trucks.

On December 2, 1999, Phelps Dodge Corp. completed its acquisition of Cyprus Amax Minerals Co., which includes all of Cyprus' Colorado molybdenum interests—the Henderson Mine, the Climax Mine in Lake County, and the Mount Emmons property in Gunnison County.

In 1999, the sole major precious-metal-producing mine in the State was the Cripple Creek and Victor Gold Mining Co. (CC&V) Cresson Mine in the Cripple Creek district, Teller County. During 1999, CC&V mined a total of 36 million metric tons (Mt) of material at the Cresson Mine, including 9.4 Mt of ore at a grade of 1 gram per metric ton (g/t) gold. The total 1999 gold production at the Cresson Mine was 7.2 t of gold and an estimated 2.5 t of silver. CC&V plans to increase metal production in 2000 to 7.65 t of gold and 2.7 t of silver.

CC&V continued its ambitious and successful exploration and development drilling program in 1999. At the end of 1998, the Cresson Mine had a proven and probable reserve of 115 Mt at a grade of 1.16 g/t gold for a total of 134 t of contained gold. Exploration in 1999 increased gold in ore reserves to 150 t.

In March 1999, AngloGold Ltd., the world's largest gold producer, purchased Minorco Group's 67% share of the CC&V. AngloGold is a subsidiary of Anglo American Corp. of South Africa.

Asarco's Black Cloud Mine near Leadville is an underground room and pillar mine with a daily production capacity of 794 t. The ore body is a complex massive sulfide deposit hosted by the Leadville Limestone. In January 1999, mining operations at the Black Cloud Mine ceased because of depletion of its ore.

After a year filled with legal problems, the Yule Marble Quarry near Marble, CO, is back in production under new ownership. The new owner is Sierra Minerals Corp., based in Englewood, CO. Sierra Minerals began producing about 90 t of marble per month from stockpiled inventory. The company started cutting new stone in January 2000.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] James A. Cappa, Chief, Minerals and Mineral Fuels, at the Colorado Geological Survey, authored the text of mineral industry information submitted by that agency.

The Centex American Gypsum Corporation produced 408,000 t of gypsum in 1999 from its open pit gypsum mine and plant in Gypsum, Eagle County. That amount is an increase of 10% over the 1998 production of 370,000 t. In April 1999, the company completed a 2-year expansion program to increase the production capacity of the mine and plant to 500,000 metric tons per year. Production is expected to increase to that level in 2000 and 2001.

Holnam Inc. has begun construction on a $200-million addition to its existing cement plant in Florence to meet increased demand because of Colorado's strong economy. Grupo Mexico has applied for various permits for its proposed cement plant in the designated free trade zone south of Pueblo.

American Soda, L.L.P. of Glenwood Springs spent most of 1999 acquiring permits from Garfield and Rio Blanco Counties and the Bureau of Land Management for its Piceance Creek Basin soda ash solution mine, pipeline, and processing and loading facilities. All of the permits have been granted and construction is underway. The company plans to use a steam tunnel to convert the sodium bicarbonate from the nahcolite to sodium carbonate, or as it is commonly known, soda ash. American Soda plans to produce about 1.3 Mt of soda ash and sodium bicarbonate per year. The planned solution mine will be located near Meeker, CO. A 67-km pipeline will transport the pregnant solution to a redesigned Unocal oil shale processing plant north of Parachute for further refining and packaging.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN COLORADO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	258	1,970	257	1,840	259	1,800
Gemstones	NA	254	NA	257	NA	262
Lime	30	1,850	40	1,820	40	1,800
Sand and gravel: Construction	32,100	142,000	42,900	195,000	45,200	209,000
Stone:						
Crushed	9,720	60,800	12,000	63,800	12,300	67,300
Dimension metric tons	10,800	3,250	14,200	3,410	13,600	3,580
Combined values of cement, clays (bentonite, 1998), gold, gypsum (crude), helium (Grade-A), lead, molybdenum, peat (1997-98), sand and gravel (industrial), silver, zinc	XX	313,000	XX	306,000 r/	XX	271,000
Total	XX	524,000	XX	572,000 r/	XX	555,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
COLORADO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	6	1,790	$11,100	$6.22	6	2,470	$16,200	$6.56
Granite	6	5,710	38,000	6.66	7	6,090	29,100	4.78
Sandstone and quartzite	6	403 r/	2,940 r/	7.29 r/	9	651	3,450	5.30
Traprock	1	W	W	3.72	1	W	W	5.52
Volcanic cinder and scoria	2	W	W	W	2	W	W	4.46
Miscellaneous stone	3	W	W	W	7	W	W	5.46
Total or average	XX	9,720	60,800	6.26	XX	12,000	63,800	5.34

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	154	$945	$6.14
Other coarse aggregate	15	132	8.80
Total or average	169	1,080	6.37
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	4.10
Bituminous aggregate, coarse	W	W	4.39
Railroad ballast	W	W	5.33
Total or average	1,760	7,430	4.23
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	6.11
Other fine aggregate	W	W	5.61
Total or average	W	W	3.91
Coarse and fine aggregates:			
Graded road base or subbase	672	2,770	4.12
Unpaved road surfacing	W	W	5.58
Terrazzo and exposed aggregate	W	W	5.55
Crusher run or fill or waste	W	W	3.72
Total or average	1,470	5,870	3.99
Other construction materials	W	W	4.88
Agricultural:			
Agricultural limestone	W	W	W
Poultry grit and mineral food	W	W	W
Other agricultural uses	W	W	W
Total or average	W	W	W
Chemical and metallurgical: Cement manufacture	W	W	5.92
Special:			
Mine dusting or acid water treatment	W	W	28.43
Asphalt fillers or extenders	W	W	W
Other fillers or extenders	W	W	W
Total or average	W	W	27.57
Other miscellaneous uses: Other specified uses not listed	W	W	9.50
Unspecified: 3/			
Actual	4,130	25,300	6.13
Estimated	1,680	9,500	5.66
Total or average	5,810	34,800	6.00
Grand total or average	12,000	63,800	5.34

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, sandstone and quartzite, traprock, and volcanic cinder and scoria.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
COLORADO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 4		District 5		District 6		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:												
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	(4/)	(4/)	(4/)	(4/)	--	--	--	--
Coarse aggregate, graded 5/	--	--	--	--	(4/)	(4/)	(4/)	(4/)	--	--	--	--
Fine aggregate (-3/8 inch) 6/	--	--	--	--	(4/)	(4/)	(4/)	(4/)	--	--	--	--
Coarse and fine aggregate 7/	W	W	W	W	(4/)	(4/)	95	364	25	119	--	--
Other construction materials	--	--	--	--	4,220	17,100	100	672	--	--	--	--
Agricultural 8/	--	--	--	--	--	--	W	W	--	--	--	--
Chemical and metallurgical 9/	--	--	W	W	W	W	--	--	--	--	--	--
Special 10/	--	--	--	--	--	--	W	W	--	--	--	--
Other miscellaneous uses	--	--	W	W	--	--	W	W	--	--	--	--
Unspecified: 11/												
Actual	W	W	--	--	W	W	1,110	7,350	--	--	16	86
Estimated	--	--	--	--	W	W	514	2,840	865	5,010	--	--
Total	164	975	855	4,860	8,180	40,900	1,850	11,800	890	5,130	16	86

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production for District 3.

3/ Includes riprap and jetty stone and other coarse aggregate.

4/ Withheld to avoid disclosing company proprietary data, included with "Other construction materials."

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), and railroad ballast.

6/ Includes stone sand (bituminous mix or seal), and other fine aggregate.

7/ Includes crusher run or fill or waste, graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other construction materials.

8/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

9/ Includes cement manufacture.

10/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	5,860	$30,600	$5.22
Plaster and gunite sands	79	504	6.38
Concrete products (blocks, bricks, pipe, decorative, etc.)	707	4,320	6.11
Asphaltic concrete aggregates and other bituminous mixtures	2,410	10,700	4.45
Road base and coverings 2/	5,360	23,400	4.36
Fill	1,290	3,630	2.83
Snow and ice control	147	601	4.09
Other miscellaneous uses 3/	273	1,200	4.40
Filtration	11	93	8.45
Unspecified: 4/			
Actual	12,300	53,700	4.35
Estimated	14,500	66,100	4.57
Total or average	42,900	195,000	4.54

1/ Data are rounded to no more than three significant digits, may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
COLORADO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	608	5,500	1,080	5,310	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	59	292	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,180	6,020	443	2,080	W	W
Road base and coverings 3/	2,400	12,200	1,300	4,340	442	1,530
Fill	W	W	411	1,240	W	W
Other miscellaneous uses 4/	W	W	W	W	W	W
Unspecified: 5/						
Actual	3,240	14,200	W	W	W	W
Estimated	3,640	15,100	3,000	13,100	1,800	7,850
Total	11,500	54,000	9,030	38,300	2,670	11,200

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	2,990	14,400	1,040	4,250	217	1,540
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	441	2,900	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	W	W
Road base and coverings 3/	476	2,380	470	1,830	268	1,110
Fill	133	365	321	1,010	W	W
Other miscellaneous uses 4/	301	1,330	W	W	W	W
Unspecified: 5/						
Actual	3,970	16,600	W	W	W	W
Estimated	3,690	19,500	791	3,510	1,540	6,990
Total	12,000	56,700	5,270	23,200	2,510	11,400

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

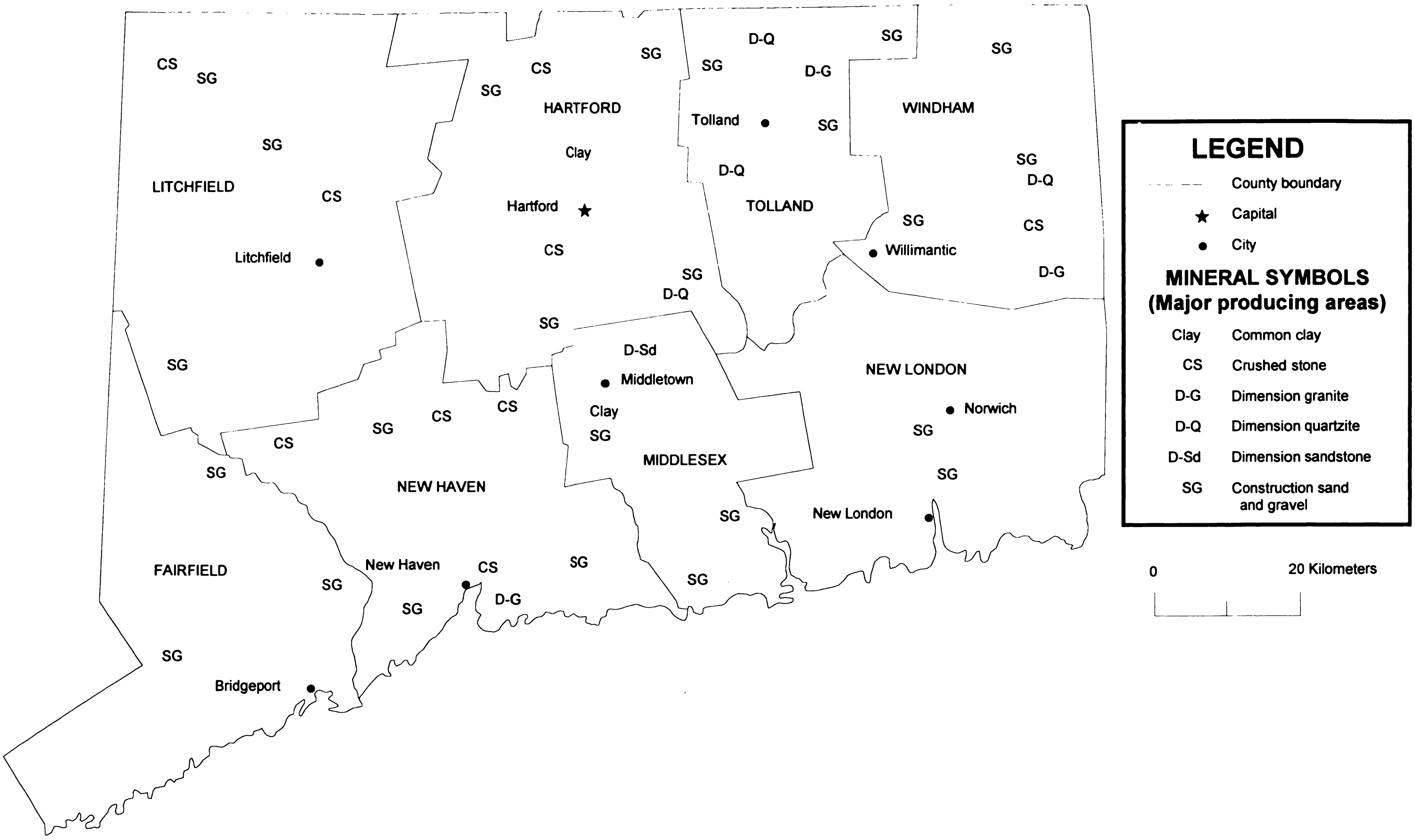
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration, railroad ballast, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

CONNECTICUT



Source: Connecticut Geological and Natural History Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF CONNECTICUT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Connecticut Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Connecticut was $102 million, according to the U.S. Geological Survey (USGS). This was about a 3% increase from that of 1998,[2] and followed a 23% increase from 1997 to 1998. Crushed stone and construction sand and gravel, the leading nonfuel mineral commodities by value, accounted for nearly all of the State's total nonfuel mineral production and value. In 1999, a $5 million increase in the value of crushed stone, somewhat offset a $2 million decrease in the value of construction sand and gravel, led to the increase for the year. The values of common clay and gemstones slightly increased, and the value of dimension stone (not included in table 1 to protect proprietary data) remained the same. In 1998, Connecticut's increase in value mostly resulted from a $14.1 million increase in crushed stone and a more than $4 million rise in construction sand and gravel (table 1).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN CONNECTICUT 1/ 2/

(Thousand metric tons and thousand dollars)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	48	90	55	W	57	W
Gemstones	NA	5	NA	5	NA	6
Sand and gravel: Construction	5,410	24,800	6,380	29,200	5,810	27,100
Stone: Crushed	5,760	55,300	7,660	69,400	8,000	74,400
Total 3/	XX	80,200	XX	98,700	XX	102,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
CONNECTICUT: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5 r/	W	W	$6.95 r/	5	1,070	$8,350	$7.82
Dolomite	1 r/	W	W	22.47 r/	1	W	W	18.68
Granite	5 r/	181 r/	$1,350	6.76 r/	4	W	W	7.27
Traprock	8	4,180	35,000	7.60 r/	10	5,930	50,100	8.45
Miscellaneous stone	2	W	W	13.27 r/	1	W	W	7.00
Total or average	XX	5,760	55,300	8.71	XX	7,660	69,400	9.06

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.
1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
CONNECTICUT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 inch):			
Riprap and jetty stone	W	W	$14.30
Filter stone	W	W	16.38
Coarse aggregate, graded: Other graded coarse aggregate	10	$159	15.92
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	16.67
Screening, undesignated	W	W	16.19
Coarse and fine aggregates:			
Graded road base or subbase	(3/)	(3/)	6.64
Unpaved road surfacing	(3/)	(3/)	6.94
Crusher run or fill or waste	(3/)	(3/)	6.50
Other construction materials	64	439	7.28
Agricultural: Agricultural limestone	42	425	10.11
Special:			
Asphalt fillers or extenders	W	W	12.50
Other fillers or extenders	W	W	33.08
Unspecified: 4/			
Actual	6,730	56,200	8.35
Estimated	356	2,790	7.83
Total or average	7,660	69,400	9.06

W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, miscellaneous stone, and traprock.

3/ Withheld to avoid disclosing company proprietary data, included with "Other construction materials."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
CONNECTICUT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products 3/	1,060	$6,710	$6.35
Asphaltic concrete aggregates and other bituminous mixtures	114	747	6.55
Road base and coverings 4/	804	4,970	6.18
Fill	211	711	3.37
Snow and ice control	217	1,250	5.74
Other miscellaneous uses	1	11	11.00
Filtration	1	9	9.00
Unspecified: 5/			
Actual	1,030	3,260	3.18
Estimated	2,950	11,600	3.92
Total or average	6,380	29,200	4.58

1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

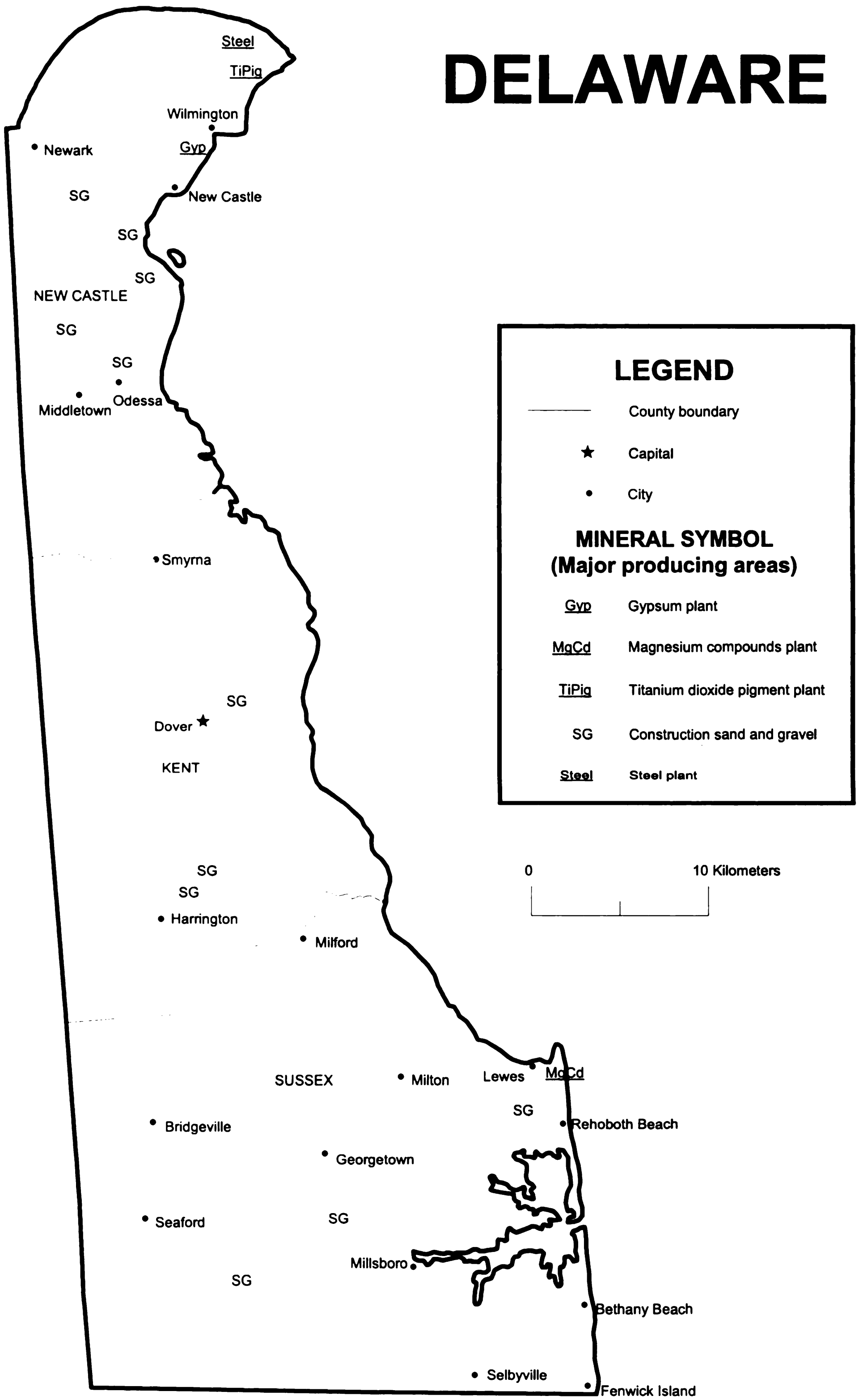
2/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes road and other stabilization (cement).

5/ Reported and estimated production without a breakdown by end use.

DELAWARE



Source: Delaware Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF DELAWARE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Delaware Geological Survey for collecting information on all nonfuel minerals.

In 1999, Delaware's preliminary estimated value[1] of nonfuel mineral production was $9.62 million, according to the U.S. Geological Survey (USGS). This was a decrease of about $2 million from that of 1998,[2] and followed a decrease of about $1 million from 1997 to 1998. Production data for magnesium compounds were withheld to protect company proprietary data, so the State's actual total values are higher than those shown in table 1.

In 1999, whereas the value of construction sand and gravel decreased and accounted for the State's drop in value, the value of magnesium compounds showed a small increase. In 1998, the value of construction sand and gravel decreased by about $0.8 million and that of magnesium compounds rose slightly. Gemstones mined by hobbyists were valued at the same level for both years. Based upon USGS estimates of the quantities produced in the United States during 1999, Delaware remained fifth of five States that produce magnesium compounds. Magnesium compounds, extracted from seawater close to the mouth of the Delaware Bay, near Lewes, Sussex County, were used to manufacture chemical and pharmaceutical products.

The narrative information that follows was provided by the Delaware Geological Survey[3] (DGS). According to the DGS, there are at least 11 major sand and gravel production operations in Delaware. General locations are shown on the map on the facing age and on the DGS Internet web site at: http://www.udel.edu/dgs/sandmap.html. The DGS estimates of the quantities of sand and gravel produced from the State's natural resources are typically higher than those previously reported by the U.S Bureau of Mines (USBM) and currently (table 1) by the USGS (Delaware Geological Survey, 1998, from Mineral resources/energy: sand and gravel, accessed June 12, 2000, at URL http://www.udel.edu/dgs/sand.html). Reasons for this discrepancy include (1) not all major producers necessarily report production to the USGS, (2) government agencies or companies that produce from pits for their own use do not necessarily report production, (3) many operations that mine relatively small amounts of sand and gravel are not contacted and therefore do not report production, and (4) production of sand from offshore areas may not be included in the figures. For example, in 1992, as reported to the USBM, approximately 2.3 million metric tons (2.5 million short tons) of sand and gravel, valued at $8.6 million, was produced in Delaware. That information was reported to the USBM by 7 companies operating 10 pits. According to the Delaware Department of Transportation during the same year, about 5.9 million short tons of "borrow/soil" were produced from 18 pits for use in the construction of State Route 1.

The U.S. Department of the Interior's Minerals Management Service (MMS) continued to provide support for studies characterizing offshore sand resources in both State and Federal waters for possible use in beach replenishment. The DGS recently completed a report entitled "Geologic Framework, Distribution, and Quality of Sand Resources in the Atlantic Offshore Delaware." A geologic framework was developed and three potential sand resource areas were identified that potentially contain nearly 70 million cubic meters of sand suitable for beach replenishment.

The DGS developed and currently operates the "DGS Atlantic Outer Continental Shelf Core and Sample Repository." Samples were contributed by Federal agencies, other State agencies, and private institutions that recognize the value of having a centralized repository. The repository contains samples from all 51 oil and gas exploratory wells drilled on the North, Middle, and South Atlantic Outer Continental Shelf between 1977 and 1984. Samples include cores, unwashed cuttings, vials containing samples processed for micropaleontology and palynology, thin sections of cores and cuttings, and micropaleontology and palynology slides. A summary of holdings can be found on the DGS Internet web site at http://www.udel.edu/dgs/ocsrepos.htm. The DGS is designated as the primary repository for these samples by the MMS.

The DGS continues to be actively involved in the mineral industry in Delaware through identification and evaluation of sand and gravel resources as part of its geologic mapping program and through service on committees involved in evaluating and renewing applications for extractive use operations.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] John H. Talley, Associate Director, authored the text of the State minerals information provided by the Delaware Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN DELAWARE 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	2,540	12,400	2,560	11,500	2,100	9,620
Total 3/	XX	12,400	XX	11,500	XX	9,620

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

TABLE 2
DELAWARE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit Value
Concrete aggregate	1,300	$6,810	$5.25
Plaster and gunite sands	W	W	4.60
Road base and coverings	W	W	7.97
Fill	982	3,170	3.22
Unspecified 3/	109	544	4.99
Total or average	2,560	11,500	4.50

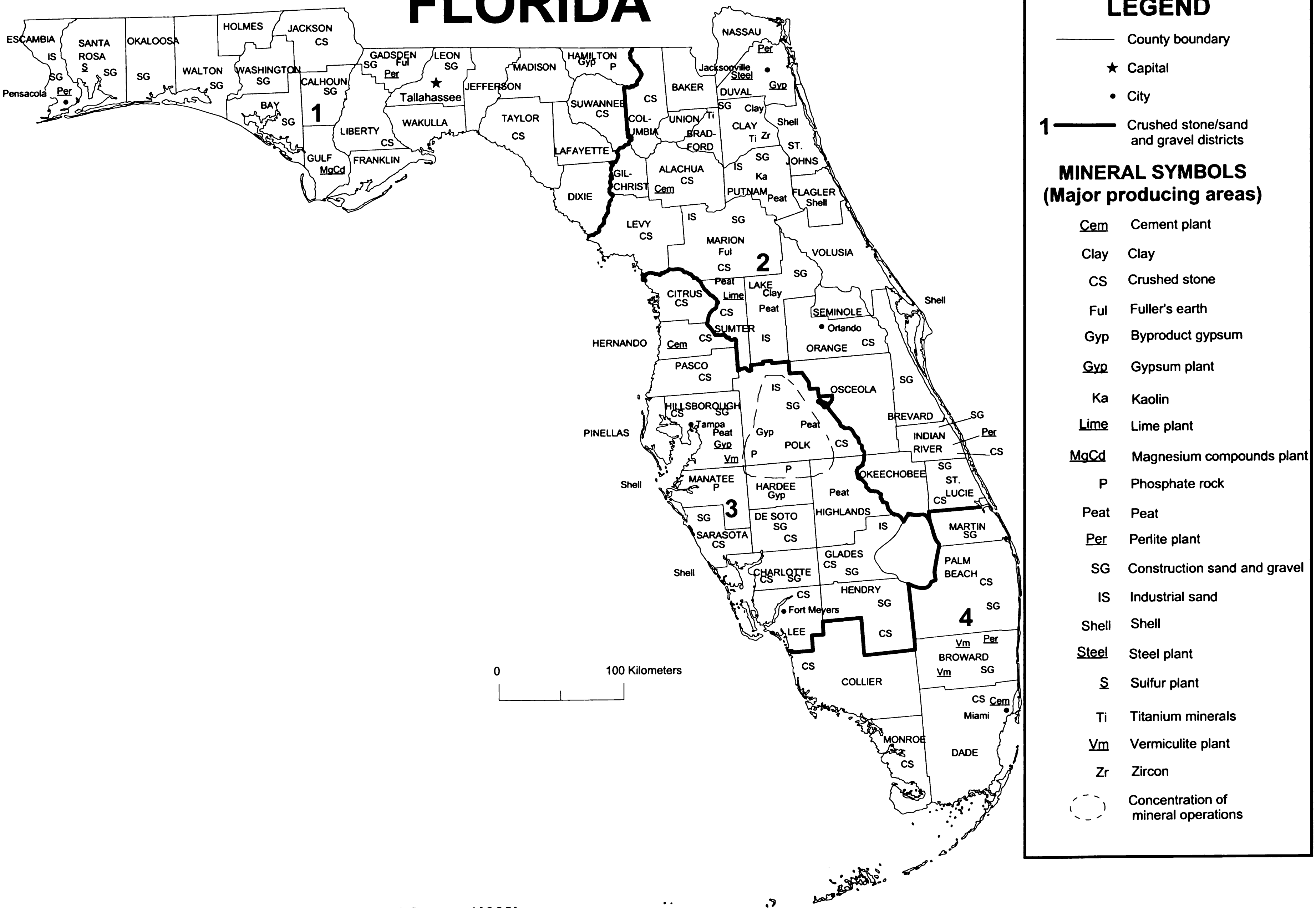
W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Estimated production without a breakdown by end use.

FLORIDA



Source: Florida Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Florida was about $1.9 billion, according to the U.S. Geological Survey (USGS). This was a more than 6% increase from that of 1998,[2] and followed a 1.1% decrease in 1998 from 1997. The increase continued an overall upward trend that began in 1994, following 4 years of lower values. In 1999, for the third time in the past 4 years, Florida ranked fourth among the 50 States in total nonfuel mineral production value, of which the State accounted for almost 5% of the U.S. total.

Florida continued to be the Nation's leading phosphate rock-mining State in 1999, producing more than six times as much as the next-highest producing State. Phosphate rock is produced in only four States. In terms of value, phosphate rock, crushed stone, and portland cement continued to be the most important raw mineral commodities produced in Florida. (Listings of mineral commodities are in descending order of value, magnitude of change in value, or quantity produced.) In 1999, increases of $80 million in phosphate rock, $32 million in crushed stone, $12 million in construction sand and gravel, and $6 million in portland cement led the State's increase in value (table 1). Relatively smaller increases in masonry cement and several other mineral commodities contributed to the overall increase. The only significant decrease was a $12 million drop in the value of zircon concentrates. In 1998, significant decreases occurred in the values of fuller's earth, crushed stone, portland cement, zircon concentrates, and ilmenite and rutile titanium concentrates. These decreases more than offset a substantial increase in the value of phosphate rock, moderate gain in construction sand and gravel, and smaller increases in masonry cement and peat, resulting in a net decrease for the year (table 1).

Based upon USGS preliminary estimates of production in the 50 States in 1999, Florida remained the only State to produce rutile concentrates and staurolite; it was first in peat and masonry cement, first of two States producing zircon concentrates, and first of three States producing ilmenite concentrates. Florida continued to be third in crushed stone production, fourth in fuller's earth, seventh in portland cement, and dropped from third to fourth in magnesium compounds. Additionally, Florida produced substantial quantities of construction and industrial sand and gravel.

The Florida Geological Survey[3] (FGS) provided the following narrative information. Most employment in Florida's mining industry was associated with the mining and processing of minerals and materials used in the State's construction industry. Based upon information the FGS received from the U.S. Department of Labor's Mine Safety and Health Administration, 6,464 persons were employed at Florida mines and mills and another 1,037 persons were employed as office staff during 1999. The limestone sector was the largest employer with over 3,150 employees, and the phosphate industry was second with nearly 2,500 workers. Most of the remaining was employment at sand and gravel, cement, heavy mineral sand, and clay mine pit operations.

Most of the stone mined in Florida was used for road construction. Florida Rock Industries, Inc. acquired Harper Brothers, Inc.'s aggregate mining and highway and heavy construction business in Ft. Myers, FL (North American Quarry News, 1999a). Southdown, Inc. agreed to acquire Sunshine Materials, Inc.'s limestone quarry site in west-central Florida (North American Quarry News, 1999b). Martin-Marietta Materials, Inc. obtained an Environmental Resource Permit (ERP) from the Florida Department of Environmental Protection's Suwannee River Water Management District for an expansion of its Perry Quarry, which was formerly operated by Florida Rock Industries, Inc. Angelo's Aggregate Materials, Ltd. proceeded with an ERP application for its Jasper Pit in Madison County. Angelo's, currently producing sand from the Jasper Pit, was developing plans to excavate limestone from portions of the Jasper Pit, in addition to its sand production. The operators of several other limestone mines, although smaller than Martin-Marietta's Perry Quarry, filed ERP applications as part of their plans to reactivate their operations. Some of the limestone is from high-purity deposits, which can be calcined (heated) and, together with other ingredients, can be used to manufacture portland and masonry cement. During the past year, Florida Rock Industries, Inc. brought its Newberry cement plant on-line and began production.

The State's sand and gravel resources can be subdivided into construction and industrial, the bulk of which is construction grade. Florida ranks approximately 15th in the Nation in construction sand and gravel used or produced and 20th in industrial sand. Whereas sand is mined at many locations throughout the State, quartz gravel is mined only along the Trail Ridge region of the peninsula and in the far northwestern regions of Florida. CSR America, Inc. (parent company of Rinker Materials Corp.) acquired Harper Brothers, Inc., Palmdale Sand Mine in Glades County, Florida. (Leu Newman, Florida Department of Environmental Protection, Bureau of Mine Reclamation, oral commun., 2000).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

The Gypsum Division of Lafarge Corp. announced plans to open a new wallboard plant in Putnam County (North American Quarry News, 1999c).

Common, fuller's earth, and kaolin clays were mined in a few locations in Florida. Fuller's earth, typically used as an absorbent material, was mined in Gadsden and Marion Counties; kaolin, often used in the manufacture of paper and refractories, was mined in Putnam County; and common clay, often used in the manufacture of brick, cement, and lightweight aggregate, was mined in small quantities from various locations throughout the State.

Two of five companies that mine heavy minerals in the United States are located in Florida. E.I. du Pont de Nemours, Co., and RGC (USA) Mineral Sands, Inc. mined respectively in Bradford and Clay Counties, which are in northeastern Florida. Following a merger of RGC's Australian parent company with another Australian company, the heavy mineral mines of Green Cove Springs and Putnam East Extended Satellite operated under the name Iluka Resources, Inc. A variety of minerals are found in Florida's heavy mineral sand deposits, including ilmenite, leucoxene, rutile (titanium minerals), and zircon. Ilmenite and rutile are primary source materials used to manufacture titanium dioxide pigments. These pigments are often used in the manufacture of paint, varnish and lacquers, plastics, and paper.

According to the FGS, Florida producers supplied approximately 25% of the world's phosphate needs and 75% of U.S. domestic needs. Based upon FGS surveys and estimates, approximately 34 million metric tons of phosphate rock was mined in the State in 1999, nearly all of which was used to manufacture agricultural fertilizer. The remainder was used in products such as feed supplements, vitamins, soft drinks, and toothpaste. In 1998, $1.8 billion worth of fertilizer was exported, making it one of Florida's leading export commodities.

Phosphate companies actively mining in the State included the IMC-Agrico Co., Cargill Fertilizer, Inc., CF Industries, Inc., Agrifos, L.L.C., Potash Corporation of Saskatchewan, and Nu-Gulf Industries, Inc. Farmland Hydro, L.P. planned to apply to open a new mine in Hardee County.

Mulberry Corp.'s Piney Point phosphate plant (formerly owned by Royster Phosphates, Inc.) in North Manatee County was reopened in August, employing about 170 people, but closed again in October because of challenges from environmental groups. All Mulberry plants were closed in December.

For IMC-Agrico, 1999 was a very busy year. It applied to open two new mines, Ona and Pine Level, but shut down several operations. IMC-Agrico permanently closed the Payne Creek and Noralyn-Clear Springs Mines. Near the end of 1999, the company also planned to close some plants in central Florida and Louisiana to cut output by more than 20% because of "a global fertilizer glut." IMC-Agrico announced that it planned to close its Nichols chemical plant east of Tampa (74 workers). The company planned to cease production of triple superphosphate, one of three major crop nutrients, at its New Wales chemical plant. Mine shutdowns also occurred at Cargill's Ft. Meade Mine (several weeks) and at Nu-Gulf's Wingate Creek Mine (News-Journal online, November 14, 1999, Nation's largest phosphate company to close mines, plants, accessed June 15, 2000, at URL http://www.n-jcenter.com/1999/Nov/14/). IMC-Agrico received conceptual approval for a 69-hectare (ha) expansion at its Four Corners Mine near Duette. The project was on hold because of problems with the county government and consultants' reports. Opposition from the State delayed the company's planned expansion of about 1,140 ha at its Ft. Green Mine near Duette (Herald Tribune News Coast, September 3, 1999, State opposes Manatee Mine expansion, accessed June 15, 2000, at URL http://www.newscoast.com).

In the peat sector, the Hyponex Co. announced plans to mine approximately 53 ha of South Lake County marshland (Orlando Sentinel, 1999). American Peat, Inc. was preparing an ERP application for the Loper Peat Mine in Madison County, formerly operated by W.C. Loper.

References Cited

North American Quarry News, 1999a, Florida Rock Industries completes acquisition of Harper Bros., Inc.: North American Quarry News, July, v. 1, p. 6.

———1999b, Southdown lands Florida ready-mix concrete and aggregates producer: North American Quarry News, August, v. 1, p. 8.

———1999c, Lafarge to build new wallboard production facility in Florida: North American Quarry News, October, v. 1, p. 15-16.

Orlando Sentinel, 1999, Mine may turn muck to bucks: Orlando Sentinel, September 8, p. 2.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantit	1999 p/ Value
Cement:						
Masonry	406	36,200 e/	442	40,600 e/	454	42,000 e/
Portland	3,750	274,000 e/	3,470	259,000 e/	3,560	265,000 e/
Gemstones	NA	1	NA	1	NA	1
Peat	361	5,710	391	7,360	354	7,920
Sand and gravel:						
Construction	19,200	75,500	20,900	84,600	23,500	96,700
Industrial	507	5,800	525	6,150	516	6,410
Stone: Crushed 3/	73,600 r/	394,000 r/	81,000	377,000	85,800	409,000
Combined values of clays (common, fuller's earth, kaolin), magnesium compounds, phosphate rock, staurolite, stone (crushed marl), titanium concentrates, zirconium concentrates and values	XX	1,040,000	XX	1,030,000	XX	1,100,000
Total	XX	1,830,000	XX	1,810,000	XX	1,930,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of Quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	70 r/	70,400 r/	$376,000 r/	$5.3 r/	91	76,600	$351,000	$4.15
Limestone-dolomite	2	W	W	5.74	2	W	W	7.62
Dolomite	4	W	W	6.42	4	W	W	5.78
Calcareous marl	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Sandstone	--	--	--	--	1	W	W	4.00
Shell	4	W	W	4.61	6	1,950	7,940	3.70
Total or average	XX	73,600 r/	394,000 r/	5.36 r/	XX	81,000	377,000	4.65

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	94	$719	$7.65
Filter stone	106	776	7.32
Other coarse aggregate	66	407	6.17
Coarse aggregate, graded:			
Concrete aggregate, coarse	6,590	43,700	6.63
Bituminous aggregate, coarse	3,000	17,100	5.69
Other graded coarse aggregate	1,740	10,200	5.90
Fine aggregate (-3/8 inch):			
Stone sand, concrete	2,200	12,000	5.45
Stone sand, bituminous mix or seal	1,660	8,730	5.27
Screening, undesignated	2,740	11,200	4.09
Other fine aggregate	2,320	12,000	5.16
Coarse and fine aggregates:			
Graded road base or subbase	13,600	50,200	3.69
Unpaved road surfacing	W	W	3.57
Crusher run or fill or waste	3,860	13,700	3.56
Other coarse and fine aggregates	1,600	6,140	3.80
Other construction materials	5,070	21,900	4.32
Agricultural:			
Agricultural limestone	438	2,680	6.11
Poultry grit and mineral food	W	W	19.94
Other agricultural uses	377	3,800	10.09
Chemical and metallurgical:			
Cement manufacture	3,440	13,200	3.83
Glass manufacture	W	W	9.89
Special:			
Asphalt fillers or extenders	W	W	12.97
Other fillers or extenders	77	426	5.54
Other miscellaneous uses: Other specified uses not listed	282	3,910	13.87
Unspecified: 3/			
Actual	23,500	105,000	4.46
Estimated	8,050	36,300	4.51
Total or average	81,000	377,000	4.65

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals totals shown.

2/ Includes dolomite, limestone, limestone-dolomite, and shell; excludes calcareous marl from total to avoid disclosing company proprietary data.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	44	214	174	1,100
Coarse aggregate, graded 4/	W	W	W	W	5,010	37,600	5,780	28,100
Fine aggregate (-3/8 inch) 5/	W	W	W	W	4,040	19,100	4,650	23,400
Coarse and fine aggregate 6/	955	4,980	8,200	28,300	3,770	15,100	6,160	21,700
Other construction materials	381	3,540	449	3,800	--	--	5,070	21,900
Agricultural 7/	196	1,400	(8/)	(8/)	327	1,630	--	--
Chemical and metallurgical 9/	--	--	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)
Special 10/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Other miscellaneous uses	--	--	(8/)	(8/)	--	--	(8/)	(8/)
Unspecified: 11/								
Actual	502	1,660	564	1,860	5,460	26,500	16,900	74,700
Estimated	677	3,090	1,080	5,230	1,500	7,260	4,800	20,700
Total	2,710	14,700	11,100	49,100	22,500	116,000	44,800	196,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excludes calcareous marl from total to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture and glass manufacture.

10/ Includes asphalt fillers or extenders and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	8,380	$38,200	$4.56
Plaster and gunite sands	480	2,060	4.29
Asphaltic concrete aggregates and road base materials 2/	693	2,320	3.34
Fill	2,560	5,910	2.31
Other miscellaneous uses	W	W	4.09
Filtration	W	W	4.94
Unspecified: 3/			
Actual	4,880	20,800	4.28
Estimated	3,300	12,300	3.72
Total or average	20,900	84,600	4.04

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1 Quantity	District 1 Value	District 2 Quantity	District 2 Value
Concrete aggregate and concrete products 2/	788	3,080	6,530	30,200
Asphaltic concrete aggregates and road base materials 3/	W	W	W	W
Fill	634	770	W	W
Other miscellaneous uses	W	W	W	W
Filtration	--	--	W	W
Unspecified: 4/				
Actual	W	W	258	1,010
Estimated	606	2,430	1,930	7,370
Total	2,370	9,060	9,470	41,500

Use	District 3 Quantity	District 3 Value	District 4 Quantity	District 4 Value
Concrete aggregate and concrete products 2/	1,540	7,040	2	5
Asphaltic concrete aggregates and road base materials 3/	139	463	286	1,040
Fill	956	2,350	W	W
Other miscellaneous uses	W	W	--	--
Filtration	W	W	--	--
Unspecified: 4/				
Actual	4,050	16,100	W	W
Estimated	760	2,480	--	--
Total	7,940	30,400	1,140	3,560

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

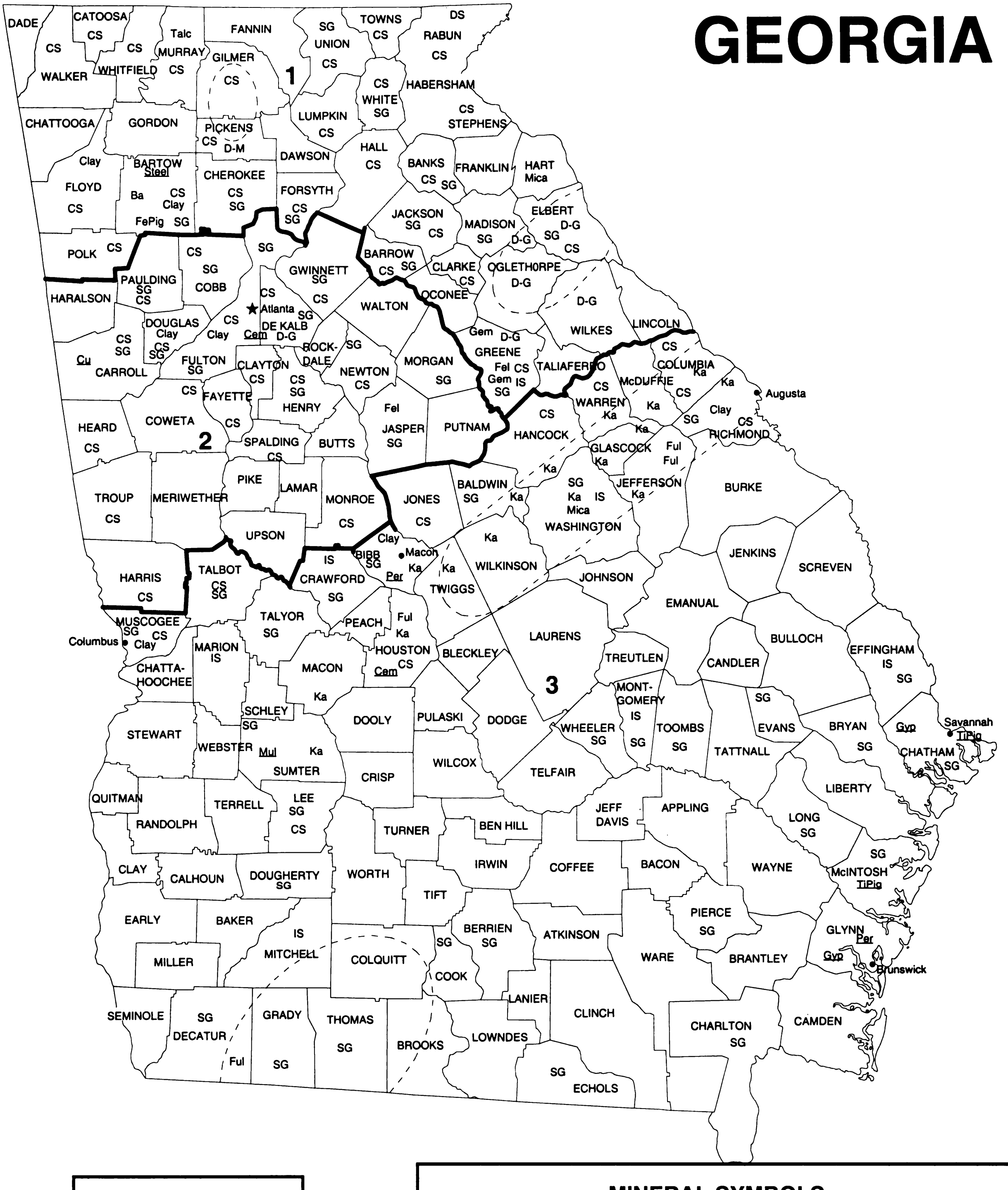
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Reported and estimated production without a breakdown by end use.

GEORGIA



LEGEND

―	County boundary
★	Capital
•	City
1 ━	Crushed stone/sand and gravel districts

0 50 Kilometers

MINERAL SYMBOLS
(Major producing areas)

Ba	Barite	DS	Dimension stone	Mica	Mica
Cem	Cement plant	Fel	Feldspar	Mul	Synthetic mullite plant
Clay	Common clay	FePig	Iron oxide pigments	Per	Perlite plant
CS	Crushed stone	Ful	Fuller's earth	SG	Construction sand and gravel
Cu	Copper plant	Gem	Gemstones	Steel	Steel plant
D-G	Dimension granite	Gyp	Gypsum plant	Talc	Talc
D-M	Dimension marble	IS	Industrial sand	TiPig	Titanium dioxide pigment plant
		Ka	Kaolin		Concentration of mineral operations

Source: Georgia Geologic Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF GEORGIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Georgia Geologic Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Georgia was $1.84 billion, according to the U.S. Geological Survey (USGS). This was about a 7% increase from that of 1998,[2] following a 2.4% increase from 1997 to 1998. The State rose in rank to fifth from seventh among the 50 States in total nonfuel mineral production value, of which Georgia accounted for more than 4.5% of the U.S. total.

Georgia was by far the leading clay-producing State in the Nation, accounting for about 26% of total U.S. clay production. Kaolin remained the State's foremost nonfuel mineral commodity in 1999, accounting for almost 58% of Georgia's estimated total nonfuel mineral value and, of that, about 93% of its clay value; crushed stone was second, accounting for more than 26% of Georgia's nonfuel mineral value. In 1999, nearly all nonfuel mineral commodities increased in value, led by a $62 million, or 6%, increase in the value of kaolin and a $43 million, or nearly 10%, increase in the value of crushed stone. Smaller yet significant increases (listed largest to smallest) occurred in construction sand and gravel, dimension stone, and portland cement; only barite, common clays, and fuller's earth showed decreased values, all of which were relatively small. In 1998, increases in kaolin, crushed stone, fuller's earth, and masonry cement led the State's increase in value; only common clay, down $6.1 million, showed any significant decrease in value for the year (table 1).

Based upon USGS estimates of the quantities produced in the United States during 1999, Georgia remained first among the 50 States in kaolin and fuller's earth; second in crude mica and second of two barite-producing States; third in iron oxide pigments; fourth in crushed stone, common clays, and feldspar; and ninth in masonry cement. Georgia rose to third from fifth in the production of dimension stone. Additionally, the State was a significant producer of portland cement and industrial sand and gravel.

The following narrative information was provided by the Georgia Geologic Survey,[3] in cooperation with representatives of Elberton Granite Association, the Georgia Mining Association, and the Georgia Crushed Stone Association. The industrial rocks and minerals mined in Georgia reflect the geologic diversity of the State's four major physiographic provinces. In the Valley and Ridge Province, limestones and shales are used for aggregate, portland cement, common brick, and floor tile manufacture. In addition, slate is crushed for aggregate and filler. Barite and iron oxide pigments (ochre and umber) are mined from weathered dolomitic rocks in the Cartersville District. In the Blue Ridge and Piedmont Provinces, igneous and metamorphic rocks (mostly gneiss and granite) are extensively mined for crushed and dimension stone as well as for feldspar, marble, scrap mica, and residual clay (for brick and portland cement.) Kyanite has been previously mined in these provinces. Sedimentary strata of the Coastal Plain province contain most of Georgia's various clay resources (common clay, fuller's earth, and kaolin), construction and industrial sand and gravel, and soft limestone (for aggregate and cement). Pleistocene barrier island sands in southeast Georgia have been mined for heavy minerals (ilmenite, leucoxene, monazite, rutile, and zircon). Throughout the State, local alluvial sand and gravel deposits are mined for aggregate.

Georgia's industrial minerals industry is dominated by kaolin, which in 1998 accounted for more than one-half of production value. Nearly all of the kaolin is mined in the Georgia Kaolin District. Approximately 72% of production is for coating and filling in paper manufacture. The remainder is used in the manufacture of various glass and ceramic products, and as fillers, extenders, and binders in adhesives, paints, plastics, and rubber. Leading kaolin producers are Imerys (formerly Imetal SA, France), Engelhard Corp., Thiele Kaolin Co., and J.M. Huber Corp.

In 1999, Imerys purchased most of ECC International Ltd., one of Georgia's leading kaolin producers. J.M. Huber acquired the remainder of ECC. Global Industrial Technologies Inc. acquired A.P. Green Industries Inc., and United Catalysts Inc. purchased Evans Clay Co.

The kaolin industry employs approximately 4,200 mine and plant personnel plus an additional 3,000 contractors. Kaolin exports increased by 2%, and kaolin was the leading export commodity out of the port of Savannah in 1998. Overall, the industry is strong; however, prospects for future growth are limited due to 1%-growth worldwide in recent years and widespread overcapacity of paper plants (which consume nearly 80% of all kaolin). Georgia kaolin faces increasing competition in many foreign markets. For example, Brazilian kaolin represents strong competition in European markets and is now being imported into North America.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at http://minerals.usgs.gov/minerals/contacts/ comdir.html; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the *Minerals Yearbook, Area Reports: Domestic 1998, Volume II*, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and expected to change, while related rankings may also be subject to change.

[3] Bruce J. O'Connor, Principal Geologist, authored the text of mineral industry information submitted by the Georgia Geologic Survey.

The crushed stone industry opened five new quarries and shipped a record high of approximately 70 million metric tons of crushed stone. A 70% increase in Federal funding (to $1 billion per year) for Georgia highway construction may fuel increased highway construction, which accounts for the largest portion of the crushed stone market. Air quality problems in the 13-county metropolitan Atlanta area have resulted in a moratorium on new highway construction and improvements. This limitation is offset by the significant increase in consumption that is anticipated outside the Atlanta region due to the Governor's program of rural highway improvement. As a result, crushed stone production in 2000 is expected to be similar to 1999.

The major crushed stone companies in the State are Hanson Building Materials America, Martin Marietta Aggregates, Vulcan Materials Co., and Blue Circle Aggregates Inc. In 1999, Vulcan acquired Colwell Construction Co., Inc., which operated three quarries in the Blue Ridge Province. In addition, all of the quarries operated by Benchmark Materials (a subsidiary of Beazer PLC), including those formerly owned by Davidson Mineral Properties and Stone Man, Inc. were consolidated into Hanson.

Georgia's dimension granite industry is concentrated in the Elberton District. During 1998, there were approximately 44 active quarries producing monument-grade granite. The industry employs approximately 2,400 individuals, including a quarry work force of 280. In 1998, the total industry payroll was $53.9 million, while the quarry payroll was $6.8 million.

Local sales of granite were stable in 1998, and demand for curbing stone for markets in the northeastern United States continued to be very strong. Sales to Pacific Rim markets declined substantially due to new domination by nearly identical stone from China. The major dimension stone companies are Star Granite Co., Keystone Memorials Co., Central Granite Co., and Georgia Structural Stone Inc. In 1999, two Georgia quarries owned by Georgia Stone Industries Inc. were purchased by Georgia Structural Stone. Keystone purchased the Georgia quarries from Rock of Ages Corp.

Two distinct types of fuller's earth clay are mined in the Coastal Plain Province. Attapulgite (palygorskite-sepiolite) clay is mined in the Meigs-Attapulgus District, and montmorillonite clay is mined in the area of the Georgia Kaolin District. The clay is used for absorbents (including pet litter), petroleum cracking catalysts, paints, pharmaceuticals, carriers for various chemicals, drilling mud, and portland cement manufacture. Principal producers are A & M Products and Oil-Dry Corp.

World class deposits of high-quality marble are in the Tate District north of Atlanta. The area produces dimension stone for the monument and decorative stone market, crushed stone for aggregate, and ground high-purity, high-calcium marble for various filler and extender applications. In 1999, Imerys acquired Georgia Marble Co., which had dominated the marble industry in Georgia for decades.

Mining in Georgia is regulated at the State level by the Department of Natural Resources, Environmental Protection Division. Permitting is a one-stop process that covers all air emission, water quality, and mine reclamation issues. Public concern is increasingly focused on airborne dust as well as surface- and ground water pollution. As a result, new crushed stone quarries, for example, require paved haul roads and crusher enclosures to meet dust emission standards.

TABLE 1

NONFUEL RAW MINERAL PRODUCTION IN GEORGIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	1,820	11,600	1,650	5,470	1,660	5,330
Fuller's earth	576	70,500	686	74,800	684	74,300
Kaolin	8,200	977,000	8,350	998,000	8,590	1,060,000
Gemstones	NA	8	NA	8	NA	8
Sand and gravel:						
Construction	6,410	24,600	7,130	29,500	8,500	36,000
Industrial	520	9,330	608	10,900	609	11,100
Stone:						
Crushed 3/	65,600 r/	431,000 r/	74,200	440,000	79,500	483,000
Dimension metric tons	65,800 3/	8,480 3/	72,100	8,790	73,700	11,900
Combined values of barite, cement, feldspar, iron oxide pigments (crude), lime, mica (crude), stone [crushed marble, dimension marble (1997)]	XX	144,000	XX	152,000	XX	157,000
Total	XX	1,680,000 r/	XX	1,720,000	XX	1,840,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
GEORGIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	29 r/	W	W	$6.31 r/	31	W	W	$6.32
Dolomite	1	W	W	5.50 r/	1	W	W	5.50
Granite	44	47,600 r/	$316,000 r/	6.63 r/	52	56,100	$326,000	5.82
Marble	7	(2/)	(2/)	(2/)	10	(2/)	(2/)	(2/)
Quartzite	1	W	W	7.31	2	W	W	3.86
Total or average	XX	65,600 r/	431,000 r/	6.57 r/	XX	74,200	440,000	5.93

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	459	$53.90	$11.73
Filter stone	W	W	8.64
Other coarse aggregate	109	360	3.30
Coarse aggregate, graded:			
Concrete aggregate, coarse	9,510	55,500	5.83
Bituminous aggregate, coarse	5,700	38,600	6.77
Bituminous surface-treatment aggregate	W	W	8.03
Railroad ballast	W	W	4.41
Other graded coarse aggregate	6,150	47,600	7.74
Fine aggregate (-3/8 inch):			
Stone sand, concrete	3,310	17,900	5.41
Stone sand, bituminous mix or seal	W	W	5.56
Screening, undesignated	1,280	4,330	3.39
Other fine aggregate	242	1,130	4.65
Coarse and fine aggregates:			
Graded road base or subbase	5,900	24,800	4.21
Crusher run or fill or waste	7,030	40,200	5.72
Other construction materials	343	1,140	3.31
Agricultural: Agricultural limestone	W	W	8.76
Chemical and metallurgical: Cement manufacture	W	W	5.44
Special: Other fillers or extenders	W	W	19.29
Other miscellaneous uses: Other specified uses not listed	4	17	4.27
Unspecified: 3/			
Actual	28,000	163,000	5.82
Estimated	985	5,490	5.57
Total or average	74,200	440,000	5.93

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, and quartzite; excludes marble from total to avoid disclosing company proprietary data.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
GEORGIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	256	1,780	820	8,320	W	W
Coarse aggregate, graded 4/	6,030	35,700	14,600	101,000	W	W
Fine aggregate (-3/8 inch) 5/	1,870	9,060	4,530	23,600	W	W
Coarse and fine aggregate 6/	3,350	15,400	9,230	48,000	W	W
Other construction materials	339	1,120	4	13	2,190	11,800
Agricultural 7/	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 9/	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)
Special 10/	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)
Other miscellaneous uses	--	--	4	17	--	--
Unspecified: 11/						
Actual	9,540	56,400	4,420	27,400	14,100	79,500
Estimated	955	5,310	--	--	W	W
Total or average	23,400	136,000	33,600	208,000	17,200	96,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excludes marble from total to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase and crusher run (select material or fill).

7/ Includes agricultural limestone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture.

10/ Includes other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,320	$9,600	$4.13
Plaster and gunite sands	601	2,760	4.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	109	524	4.81
Asphaltic concrete aggregates and other bituminous mixtures	17	37	2.31
Fill	98	255	2.60
Other miscellaneous uses 2/	281	1,580	5.62
Unspecified: 3/			
Actual	1,650	5,990	3.63
Estimated	2,050	8,790	4.29
Total or average	7,130	29,500	4.14

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road base and coverings.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
GEORGIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2		District 3	
	Quantity	Value	Quantity	Value
Concrete aggregate	473	2,560	1,850	7,030
Plaster and gunite sands	W	W	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	109	524
Asphaltic concrete aggregates and other bituminous mixtures	--	--	17	37
Road base and coverings 2/	W	W	W	W
Other miscellaneous uses	90	741	2,440	9,520
Unspecified: 3/				
Actual	111	354	1,540	5,630
Estimated	456	2,510	1,590	6,280
Total	1,130	6,170	7,550	29,000

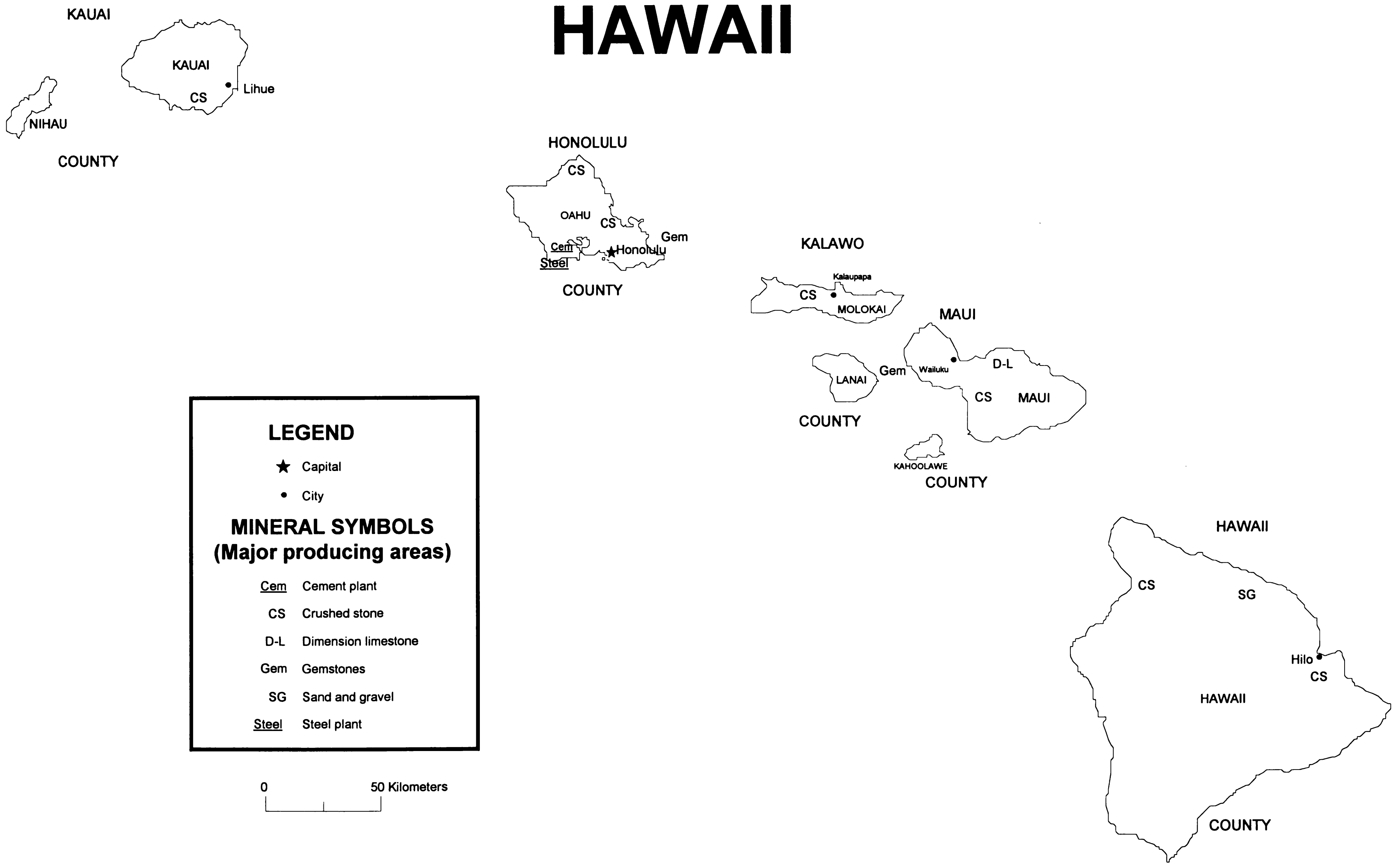
W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes fill.

3/ Reported and estimated production without a breakdown by end use.

HAWAII



Source: Hawaii Division of Water and Land Development/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF HAWAII

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Hawaii was $88.8 million, according to the U.S. Geological Survey (USGS). This was about a 5% increase from that of 1998[2] and followed a 9.8% decrease from 1997 to 1998.

Mining in Hawaii consisted mostly of the quarrying of stone to produce crushed stone and the extraction of sand and gravel from open pits for use by the construction industry. All of the State's portland cement, albeit from imported clinker, was produced at one grinding plant on the island of Oahu, Honolulu County. The increase in value in 1999 is mostly attributable to a more than $3 million increase in the value of crushed stone. Relatively smaller increases occurred in construction sand and gravel, portland cement, and gemstones. (Listings of mineral commodities are in descending order of value or magnitude of change in value.) In 1998, the State's nonfuel mineral value decrease mostly resulted from a $5.6 million drop in the value of crushed stone and an estimated $4 million decrease in that of portland cement. Both crushed stone and portland cement have shown an overall decrease in value since 1992, when they reached State highs. In 1992, about 9.5 million metric tons of crushed stone was produced and valued at $93.5 million and 520,000 tons of portland cement was produced and valued at $54 million.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN HAWAII 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Cement:						
Masonry	3	332 e/	3	329 e/	3	300 e/
Portland	252	29,600 e/	251	25,600 e/	257	26,000 e/
Gemstones	NA	66	NA	77	NA	105
Sand and gravel: Construction	378	4,210	368	4,590	400	5,090
Stone: Crushed	5,560	59,500	5,500	53,900	5,700	57,300
Total	XX	93,700	XX	84,500	XX	88,800

e/ Estimated. p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
HAWAII: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	409	$3,090	$7.55	7	357	$2,160	$6.06
Granite	1	W	W	7.72 r/	1	582	2,490	4.27
Sandstone	1	W	W	9.79 r/	1	W	W	3.33
Traprock	17	3,870	44,400	11.49	20	4,030	44,600	11.09
Volcanic cinder and scoria	2	W	W	2.37	2	W	W	4.39
Miscellaneous stone	1	W	W	11.56	2	W	W	9.78
Total or average	XX	5,560	59,500	10.71	XX	5,500	53,900	9.79

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.

TABLE 3
HAWAII: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	4	$50	$12.62
Filter stone	145	2,160	14.89
Other coarse aggregate	50	483	9.67
Coarse aggregate, graded:			
Concrete aggregate, coarse	998	13,100	13.11
Bituminous aggregate, coarse	327	1,780	5.45
Bituminous surface-treatment aggregate	W	W	14.53
Other graded coarse aggregate	149	1,990	13.36
Fine aggregate (-3/8 inch):			
Stone sand, concrete	358	5,150	14.39
Stone sand, bituminous mix or seal	W	W	16.26
Screening, undesignated	84	727	8.66
Other fine aggregate	140	1,850	13.19
Coarse and fine aggregates:			
Graded road base or subbase	592	4,430	7.48
Unpaved road surfacing	W	W	3.53
Crusher run or fill or waste	560	2,930	5.23
Other coarse and fine aggregates	286	2,580	9.01
Other construction materials	53	178	3.37
Agricultural: Agricultural limestone	W	W	9.53
Other miscellaneous uses: Other specified uses not listed	2	34	17.24
Unspecified 3/	1,580	14,900	9.39
Total or average	5,500	53,900	9.79

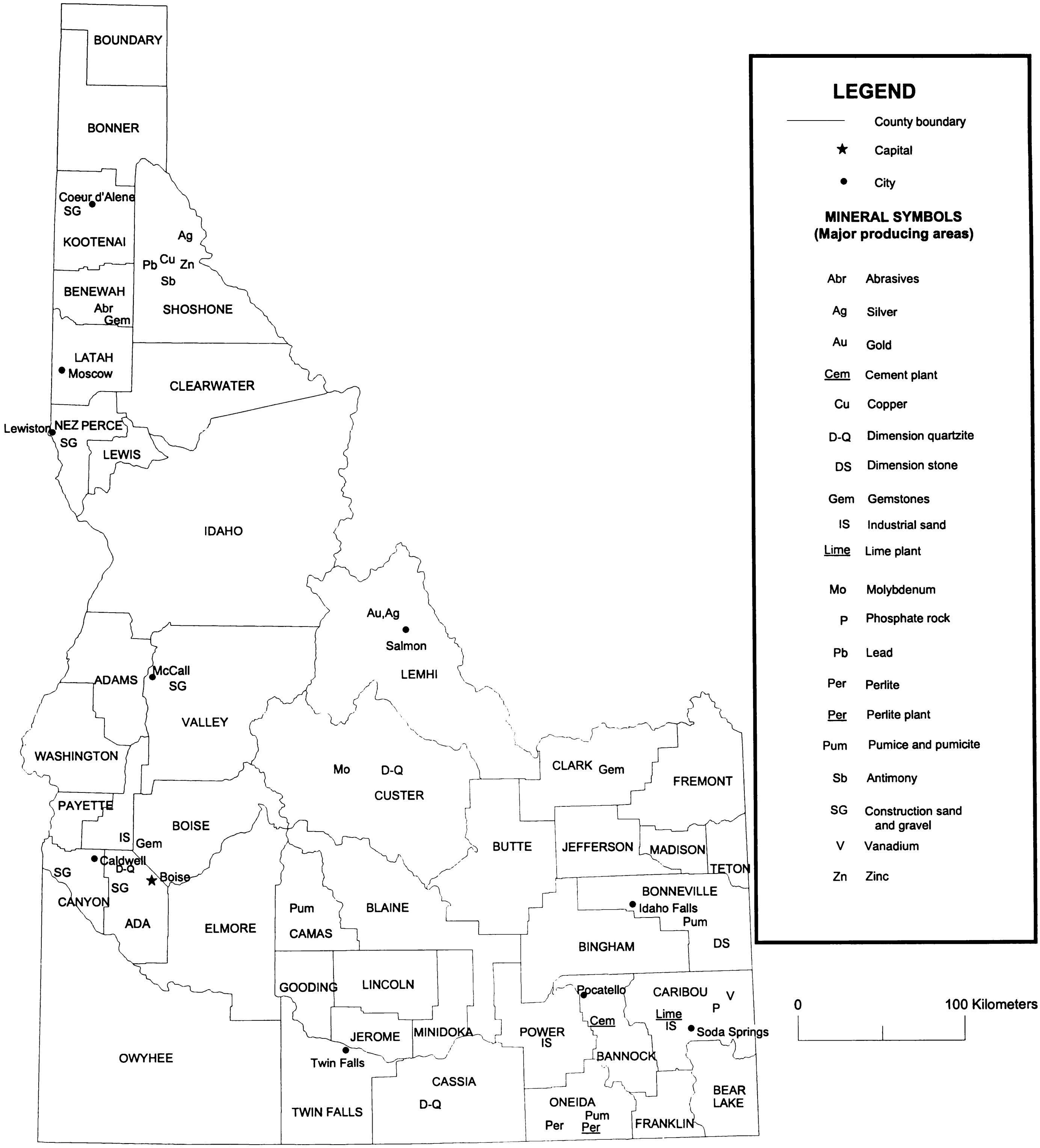
W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits, except unit values; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, sandstone, traprock, and volcanic cinder and scoria.

3/ Estimated production without a breakdown by end use.

IDAHO



Source: Idaho Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF IDAHO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Idaho Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Idaho was $420 million, according to the U.S. Geological Survey (USGS). This was about a 4% decrease from that of 1998[2] and followed a 6.4% decrease from 1997 to 1998. The State remained at 32d among the 50 States in total nonfuel mineral production value, of which Idaho accounted for more than 1% of the U.S. total.

Phosphate rock, silver, construction sand and gravel, molybdenum, and gold were, by value, Idaho's leading nonfuel minerals. Continuing a trend, gold and molybdenum production and value decreased. In 1999, a more than $10 million increase in phosphate rock plus smaller increases in crushed stone and dimension stone were more than balanced by decreases in other nonfuel minerals. The values of gold, molybdenum, construction sand and gravel, and silver (descending size of decrease) declined, resulting in the State's overall drop in value for the year. All other mineral commodities had relatively small increases, except for some small decreases in the values of copper, industrial garnet, and lead. In 1998, increases of almost $20 million, $10 million, and $9 million, respectively, in silver, construction sand and gravel, and lead somewhat mitigated decreases in gold, molybdenum, and lime (totaling almost $65 million), which were mostly responsible for the State's drop in value (table 1).

Based upon USGS estimates of the quantities produced in the United States during 1999, Idaho remained the only State to produce antimony ore and vanadium (from ferrophosphorous slag); second of three industrial garnet-producing States; third in silver, molybdenum, and lead (descending order of value); fourth in pumice and pumicite; sixth in feldspar; eighth of 12 gold-producing States; and ninth in gemstones. The State rose to second from third in the production of phosphate rock and to sixth from seventh in zinc. Additionally, the State was a significant producer of construction and industrial sand and gravel and dimension stone.

The Idaho Geological Survey[3] (IGS) provided the narrative information that follows. Production data in the following text are those reported by the IGS, based upon its own survey and estimates. The data differ from some production figures reported by the USGS. Idaho's metal mining continued to be constrained by the international downturn in metal prices and increased regulatory uncertainties related to environmental issues. Exploration was especially hard hit, but the phosphate mines and plants, Idaho's largest mineral industry, were also adjusting to new environmental expenditures and permitting requirements. Construction materials, such as sand and gravel and decorative stone, were in high demand. Mining and associated chemical and fertilizer processing employed approximately 3,380 persons in Idaho during the year.

Meridian Gold Co.'s Beartrack Mine in Lemhi County achieved a record production level in 1999, pouring 4,128 kilograms (kg) of gold and 5,392 kg of silver from 4.6 million metric tons (Mt) of ore during its final full year of production. Due to reduced gold prices and the consequent reduction of reserves, Beartrack will close in the first quarter of 2000. Reclamation of the North Pit was nearly complete, and mining centered on the South and Mason-Dixon Pits. The heap-leach operation employed 125 persons. The mine hosted an appreciatory open house on July 10 for hundreds of local citizens.

CSC Mining Co. continued development work at the Rescue Mine near Warren in Valley County. CSC started another ramp, built a new tailings pond, and made surface improvements while waiting for gold prices to improve. Idaho's other major gold mines have closed and were in reclamation. Kinross Gold Corp.'s DeLamar Mine in Owyhee County stopped mining and milling at the end of 1998 and was placed on care-and-maintenance status. Ore reserves at the DeLamar Mine have been exhausted, but much of the resource was conserved at the nearby Stone Cabin Mine. Reclamation of the Jacobs Gulch waste dump and parts of the Tip Top Pit at the nearby Stone Cabin Mine were underway. U.S. Antimony Corp. was also closing and reclaiming its small Yellowjacket gold-copper mine in Lemhi County. U.S. Antimony backfilled the pit with tailings.

North Idaho's famous Coeur d'Alene District, or Silver Valley, had three deep underground mines operating. Production in 1999 was down slightly from 1998, with some 404 metric tons (t) of silver produced versus 417 t in 1998. Substantial amounts of lead, zinc, and copper were also mined. Also, this area produces the only antimony ore in the United States. Lower silver and base metal prices cut into revenues at the three operating mines: Sunshine Mining Co.'s Sunshine

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Virginia S. Gillerman, Research Economic Geologist, authored the text of the Idaho mineral industry information submitted by the Idaho Geological Survey.

Mine, Hecla Mining Co.'s Lucky Friday Mine, and Silver Valley Resources Corp.'s Galena Mine. In September, Coeur d'Alene Mines acquired ASARCO Incoporated's 50% interest in Silver Valley Resources, giving Coeur d'Alene Mines 100% ownership of Silver Valley Resources, which includes the Galena Mine and the inactive Coeur Mine. Exploration drilling at Galena brought to light a new high-grade vein, the 117 vein, which was being developed on three levels. The new 72 vein was also unveiled. Sunshine announced new discoveries in the West Chance area of the Sunshine Mine at Kellogg early in the year. The company also started work on a major exploration ramp eastward from the Sunshine Mine to the Con Silver shaft, but a lack of funds shut down the project in November, some 396 meters (m) east of the Sunshine workings. Hecla Mining increased production to 137 t of silver at the Lucky Friday Mine in Mullan. More than 85% of the production was coming from the underhand and overhand stopes in the Gold Hunter deposit that has been in operation only since mid-1997.

Thompson Creek Mining Co. continued to operate its large molybdenum mine in Custer County, although molybdenum prices were low. About 7,700 t of molybdenum in concentrate and special high-performance lubricant grade was extracted from the open pit mine. Interim decisions from the U.S. Forest Service on a Supplemental Environmental Impact Statement allowed operation of the pyrite reduction plant to minimize sulfides in tailings used in the tailings dam.

Phosphate rock, from the Phosphoria Formation in Caribou County in southeastern Idaho, is the State's most valuable mineral commodity, and Idaho is the Nation's only producer of elemental phosphorus. Production from the four large open pit mines increased to over 6.2 Mt of crude ore in 1999. Simplot Co.'s Smoky Canyon Mine was the largest producer with 2.3 Mt of crude ore, which it then processed and pumped through a slurry pipeline to its phosphoric acid plant in Pocatello. Simplot drilled over 80 exploration holes. Agrium Inc. operated the Rasmussen Ridge Mine and upgraded its fertilizer plant at Conda. Solutia Inc. extracted 1.2 Mt from the Enoch Valley Mine, and completed a highway underpass and 500-m overland conveyor for safer ore unloading at its elemental phosphorus plant in Soda Springs. FMC Corp. mined the B pit at its Dry Valley Mine and worked on reducing dust emissions and making other environmental improvements at its large elemental plant in Pocatello, as required in an agreement with the U.S. Environmental Protection Agency. All of the companies were developing better plans and mitigation for selenium, a natural constituent of the waste shales, in new mines and in existing pits and waste dump reclamation. In corporate news, FMC and Solutia Inc. announced a marketing joint venture, Astaris LLC, and, in October, FMC and Agrium Inc. announced plans to build a $90 million new purified phosphoric acid plant at Conda. The plant will be built and operated by Agrium.

In other industrial mineral highlights, demand for aggregate and decorative stone was strong. Ash Grove Cement Co. had another record year of clinker production at its cement plant at Inkom. L and W Stone expanded its Three Rivers stone quarry near Clayton. Teague Minerals Co. reported good sales of Idaho zeolite from the CH pit in Owyhee County. Hess Pumice Products Inc. purchased the Malad perlite operation from Idaho Minerals Co. for $3.5 million, and opened a new pit. Hess also produces ultrafine, ultrapure pumice powder used for polishing television screens.

Exploration, particularly outside of active mining operations, was minimal, due to low metal prices and Federal restrictions focusing on endangered species and water-quality issues. Formation Capital Corp. drilled 11 core holes, totaling 1,600 m, into its Sunshine project in the Blackbird Mining District of Lemhi County. The district is one of two high-grade cobalt deposits in the United States. The drilling extended the ore horizons along strike and down dip. Results of this year's drilling and a prefeasibility study by Mine Development Associates were encouraging, and Formation started environmental baseline monitoring during the fall. Reserves to date are over 1.4 Mt of copper-cobalt-gold ore suitable for underground mining and milling to produce both copper and cobalt concentrates. Formation's property also includes numerous untested targets in the district.

Dormant precious metal projects with drilled out resources included the Petsite and Buffalo Gulch projects near Elk City in Idaho County, the Thunder Mountain project east of Yellow Pine, the Atlanta project in Elmore County, and the Kilgore property in eastern Idaho. And finally, Intergold Corp. faced lawsuits and Internet accusations over the gold assays on their Blackhawk property north of Shoshone in Lincoln County. The company had reported gold mineralization in unaltered rhyolite, but normal fire assays could not recover the gold, and many geologists remained skeptical of the project. After many promotional press releases, stock sales, and the start of chain-of-custody drilling by Dames and Moore Group, the company sued its consultants and labs. In January 2000, Intergold announced that new tests concluded that economic gold mineralization was not present at the property and that the company was ceasing its efforts there.

Government actions and legislation related to mining were restricted to environmental issues, and virtually all of the major mining concerns were affected. The Bunker Hill Superfund cleanup was nearing completion, although some Federal agencies and tribes were considering extension of the Superfund designation to the entire Coeur d'Alene River basin. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund) actions also reached the southeastern Idaho phosphate producers, as the South Maybe Canyon site was put on the Superfund list due to selenium leaching from the old waste dumps. The Selenium Task Force continued sampling programs and research on ways to minimize the selenium releases. Exploration, whether by major companies or recreational dredge miners, was adversely affected by additional endangered species designations and habitat restrictions, as well as by the Federal Government's initiation of a potential road-free area withdrawal on Federal lands in the West.

At the State level, the mining industry and the Idaho Department of Lands agreed on a new program to divert part of the mine license tax to a new fund that would be used to reclaim inactive and abandoned mine sites. Interagency efforts to identify problems and to inventory inactive and abandoned mine sites continued, with the IGS conducting many of the field examinations.

Environmental reclamation projects around Idaho included the Bunker Hill Superfund site, Triumph Mine in central Idaho, Blackbird Mine in Lemhi County, several closed gold mines, and most notably the Stibnite Mine in Valley County. After mining during World War II, the Bradley Mill tailings have had long standing and difficult environmental problems. The tailings occupy about 32 hectares of Meadow Creek drainage at Stibnite. In recognition of its outstanding work and commitment, Mobil Oil Corp. and its contractors, Woodward-Clyde and Nelson Construction, were awarded Idaho Land Board Reclamation awards for their successful efforts to stabilize the Bradley Mill tailings and to restore the Meadow Creek channel and fish habitat.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IDAHO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Antimony	metric tons	356	W	242	W	W	W
Gemstones		NA	687	NA	321	NA	357
Gold 3/	kilograms	7,490	80,100	W	W	W	W
Pumice and pumicite	metric tons	83,100	758	73,400	686	75,100	717
Sand and gravel:							
Construction		14,800	42,700	16,600	52,400	13,500	43,400
Industrial		630	7,950	710	8,470	658	9,130
Silver 3/	metric tons	341	53,600	447	73,200	401	69,000
Stone:							
Crushed		3,910 4/	18,700 4/	4,180	18,400	4,800	21,600
Dimension		W	W	15,900	4,710	28,900	7,480
Combined values of cement [masonry (1997), portland], copper, feldspar, garnet (industrial), lead, lime, molybdenum, perlite (crude), phosphate rock, stone [crushed quartzite (1997), dimension quartzite and miscellaneous (1997)], vanadium ore, zinc, and values indicated by symbol W		XX	264,000	XX	281,000 r/	XX	268,000
Total		XX	469,000	XX	439,000 r/	XX	420,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Excludes certain stones; value included with "Combined values" data.

TABLE 2
IDAHO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7	1,150	$5,860	$5.09	7	1,040	$4,030	$3.88
Granite	3	140	243	1.74	4	256	911	3.56
Quartzite	4	W	W	W	8	466	2,050	4.41
Shell	--	--	--	--	1	23	77	3.35
Traprock	22	1,460	6,420	4.39	25	1,900	8,960	4.72
Miscellaneous stone	4	1,160	6,190	5.35	11	497	2,320	4.66
Total or average	XX	3,910	18,700	4.78	XX	4,180	18,400	4.39

W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
IDAHO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	68	$357	$5.25
Filter stone	50	263	5.26
Other coarse aggregate	88	349	3.97
Total or average	206	969	4.70
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	3.85
Bituminous aggregate, coarse	124	657	5.30
Bituminous surface-treatment aggregate	30	126	4.20
Railroad ballast	W	W	8.50
Other graded coarse aggregate	W	W	4.68
Total or average	257	1,210	4.69
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	4.40
Screening, undesignated	W	W	3.33
Other fine aggregate	W	W	4.40
Total or average	50	191	3.82
Coarse and fine aggregates:			
Graded road base or subbase	430	1,900	4.41
Unpaved road surfacing	163	604	3.71
Crusher run or fill or waste	47	239	5.09
Other coarse and fine aggregates	239	1,050	4.40
Total or average	879	3,790	4.31
Agricultural:			
Poultry grit and mineral food	11	37	3.36
Other agricultural uses	33	108	3.27
Total or average	44	145	3.30
Chemical and metallurgical:			
Cement manufacture	W	W	3.30
Lime manufacture	W	W	4.21
Flux stone	W	W	W
Sulfur oxide removal	2	5	2.50
Total or average	896	3,450	3.84
Special: Mine dusting or acid water treatment	2	8	4.00
Unspecified: 3/			
Actual	1,430	6,740	4.73
Estimated	421	1,860	4.42
Total or average	1,850	8,600	4.66
Grand total or average	4,180	18,400	4.39

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, sandstone and quartzite, traprock, and volcanic cinder and scoria.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
IDAHO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	1,390	$5,960	$4.30
Plaster and gunite sands	14	70	5.00
Concrete products (blocks, bricks, pipe, decorative, etc.)	27	225	8.33
Asphaltic concrete aggregates and other bituminous mixtures	1,140	4,190	3.68
Road base and coverings 3/	5,680	18,800	3.31
Fill	601	1,320	2.20
Snow and ice control	89	393	4.42
Railroad ballast	8	30	3.75
Other miscellaneous uses 4/	185	631	3.41
Unspecified: 5/			
Actual	3,170	7,880	2.49
Estimated	4,310	12,900	2.99
Total or average	16,600	52,400	3.16

1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

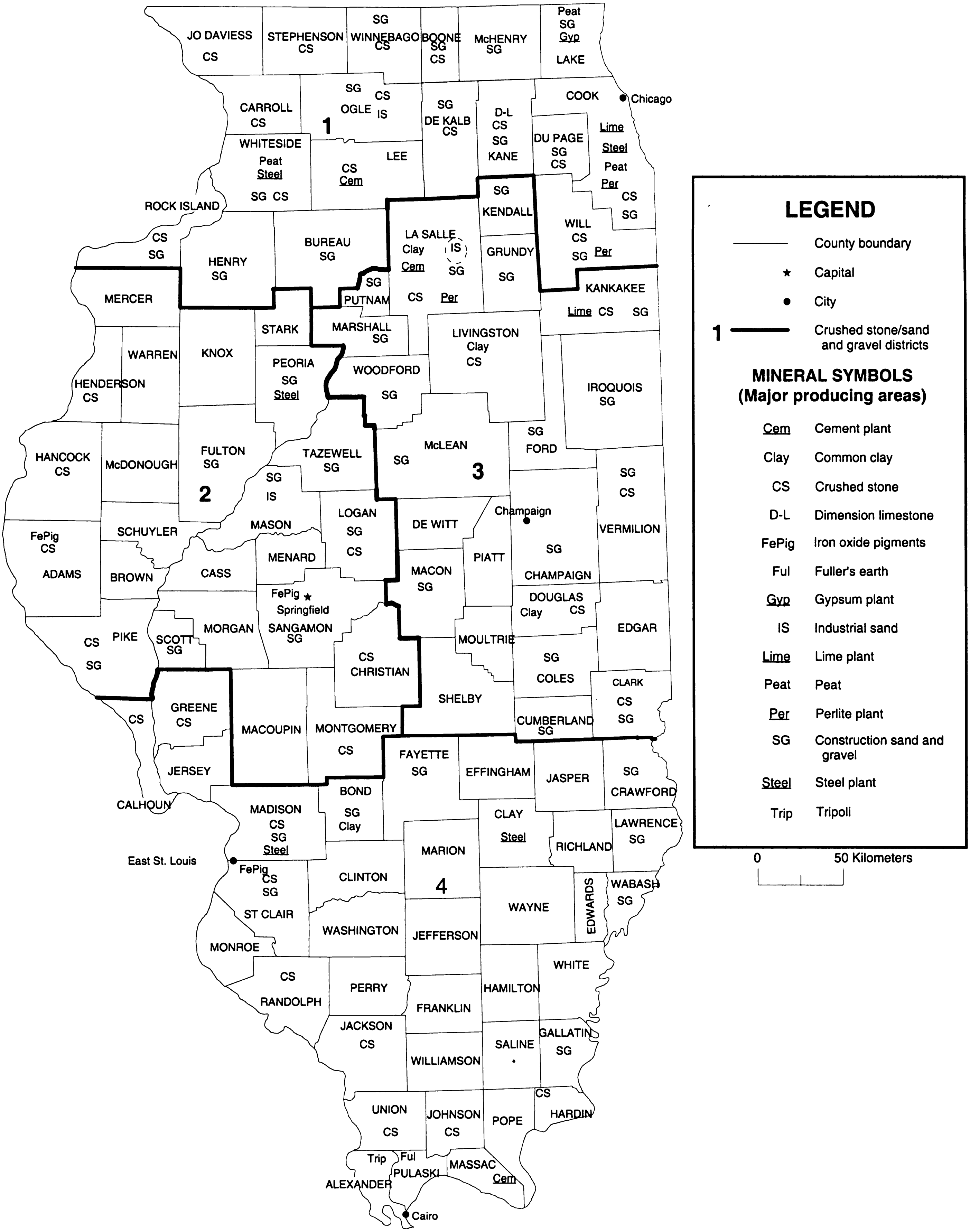
2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes road and other stabilization (cement).

4/ Includes filtration.

5/ Reported and estimated production without a breakdown by end use.

ILLINOIS



Source: Illinois State Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF ILLINOIS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Illinois State Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Illinois was $945 million, according to the U.S. Geological Survey (USGS). This was an 8% increase from that of 1998,[2] and followed a 5.5% increase from 1997 to 1998. The State remained 17th in rank among the 50 States in total nonfuel mineral production value, of which Illinois accounted for nearly 2.5% of the U.S. total.

All of Illinois' total nonfuel mineral production value in 1999 resulted from the production of industrial minerals; no metals have been produced from mines in the State since 1996, when small quantities of copper, lead, silver, and zinc were produced. Crushed stone, by value, was the State's leading commodity, accounting for about 45% of the total, followed by portland cement with almost 23%, and construction sand and gravel with about 17%. In 1999, most mineral commodities increased in value, led by crushed stone, up $51 million, and construction sand and gravel and portland cement, up $6 million each. A substantial increase also occurred in the value of tripoli. Small to marginal decreases occurred in lime, industrial sand and gravel, and fuller's earth (in descending order of change). Gemstones and common clay values were virtually unchanged. In 1998, nearly all minerals increased in value, led by portland cement, crushed stone, and construction sand and gravel. Industrial sand and gravel and lime showed smaller yet significant increases, while gemstones was unchanged (table 1).

Compared with USGS estimates of the quantities of minerals produced in the other 49 States in 1999, Illinois remained first in industrial sand and gravel and first among four States that produce tripoli; third in peat; sixth in fuller's earth; and ninth in portland cement. The State rose to 5th from 6th in crushed stone production, increased to 10th from 11th in lime, and remained a significant producing State for construction sand and gravel. Raw steel was produced in the State, but it was processed from materials obtained from other domestic and foreign sources. Illinois remained fourth in the Nation in the manufacture of raw steel with an estimated output of 6.3 million metric tons (Mt) (6.9 million short tons), according to the American Iron and Steel Institute.

The following narrative information was provided by the Illinois State Geological Survey[3] (ISGS). A comparison of the high rate of growth of crushed stone production with the slower rate of growth of sand and gravel largely reflects the conditions (demand for and the region's geology) that affect aggregate production in the greater Chicago area (northeastern Illinois). Stone production has grown by increasing production at large quarries that operate in the thick, high-quality Silurian-age dolomites that underlie much of the region. Many of these quarries could continue to be highly productive after their Silurian rock is quarried out by going underground and producing large tonnages of high-quality Ordovician-age dolomite, as Conco-Western Stone Co. has done at North Aurora in Kane County. Some companies are interested in finding stone that can be mined underground, instead of opening new quarries far away from the northeastern Illinois markets. As an added benefit, room and pillar mining such as this would generate underground space, potentially very valuable for various types of storage or other uses. Sand and gravel production increases are limited at many pits by the relatively small reserves of high-quality coarse aggregate, compared to the large high-quality stone reserves of many quarries in northeastern Illinois. Sand and gravel pits are usually mined out of coarse-aggregate much faster than are stone quarries. Companies that produce and sell all of the gravel reserves from their mine pits are often left with stockpiles of sand. As the region's construction boom continues, demand is being created for this leftover sand and it has begun to sell.

The recent extensive suburban expansion in northeastern Illinois, where unusually large sand and gravel deposits are located, has resulted in the building-over of many such deposits. In the remaining areas of potential reserves, very few new pits are being opened, mostly due to intense public opposition, greatly limiting the ability to increase production. The ISGS expects production to decline as companies, such as, Material Service Co. (Dundee) and Vulcan Materials Co. (Crystal Lake), close large operations. However, Meyer Material Co. opened a large operation on company land on the south side of Crystal Lake, McHenry County, after many hearings and lawsuits, including an attempt to go before the U.S. Supreme Court.

In north-central Illinois, the Prairie Material Group purchased Sheely Aggregates' Polo property, Ogle County, located about 12 miles north of Prairies' cement plant at Dixon (Lee County). Prairie is conserving its resources and meeting cement plant specifications by blending stone from an interval of low-magnesium limestone at Polo with high-magnesium dolomite at its Dixon quarry. The company is also economizing by trucking excess sand from east-central Illinois north to the Kankakee area and back-hauling crushed dolomite to stone-poor east-central Illinois.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] John M. Masters, Geologist, authored the text of State minerals industry information provided by the Illinois State Geological Survey.

Also in north-central Illinois, Marseilles Brick Co., La Salle County, has been supplying brick to northeastern Illinois' rapidly expanding construction market for about 10 years. Global Clay Products, LLC of Roswell, GA, purchased the company in 1999 and changed the name to Global Clay Marseilles, LLC. The plant is expected to double production in 2000 to about 125 million bricks per year, when the company's new kiln goes on-line. Increased tonnages of clay and shale will come from the company's adjacent properties.

The Mormon Church announced a plan to rebuild the temple at Nauvoo in Hancock County that was destroyed more than 150 years ago. The plan included using the same local limestone that was used in the original building. However, limestone and dolomite building stone may be shipped in from commercial operations elsewhere, due to the expense of setting up a building stone operation in an aggregate quarry or in the nearby limestone bluffs of the Mississippi River Valley, where the old building stone quarries were located.

Although fluorspar is no longer mined commercially in southeasternmost Illinois, Hastie Mining and Trucking Co., a quarry company in Hardin County, continues to operate the mineral drying and bagging facilities in Rosiclare that it purchased from Elf Atochem North America Inc. in 1998. The company processes fluorspar purchased from the National Defense Stockpile for resale.

Exploration

Few mineral test-drilling permits and plugging affidavits were recorded with the Illinois' Office of Mines and Minerals in 1998 and 1999. In the portion of Pulaski County that is generally underlain by the Porters Creek clay, exploration for absorbent clay resources continued. In northeastern Illinois, some exploration drilling was conducted for sand and gravel and dolomite resources. Whenever possible, aggregate producers have been expanding their reserves by acquiring land adjacent to existing operations or by buying smaller operations, rather than by exploring for new mine sites. As previously described, some companies are looking below their surface operations for underground reserves. More companies are bringing in aggregates from operations that are distant from their market areas.

Interest in mineral exploration in the Shawnee National Forest continued. Work continues on applications for the renewal of two prospecting permits for fluorspar in Hardin County and on applications for four prospecting permits for base metals in Alexander County.

Government Actions

According to the ISGS, the Illinois Department of Transportation's plan to expand the current Aggregate Gradation Control System (AGCS) will affect most aggregate producers. Aggregate producers are responsible for gradation control testing of coarse and fine aggregates as well as manufactured sand that is used in portland cement concrete and higher quality hot-mix asphalt layers. The planned expansion of AGCS will require producers to test gradations of all aggregate products that are used in all other asphaltic and portland cement mixtures, chip seals, and other size-graded aggregates that are used in their unbound state. Full implementation of the expanded system is scheduled for July 1, 2001.

On May 4, 1999, the Governor announced the enactment of the Illinois Fund for Infrastructure, Roads, Schools, and Transit (Illinois FIRST) by the Illinois General Assembly. The sweeping $12 billion, 5-year program targets replacing badly deteriorated bridges and roads, building new roads and bridges, constructing new classroom space, remodeling aging schools, and upgrading water and sewer systems. These and other targets of Illinois FIRST are expected to significantly increase the demand for construction aggregates in Illinois.

On August 13, 1999, the Illinois Department of Revenue published final rules that clarify the State tax exemption law (previously enacted November 14, 1997) as it affects industrial minerals operations in Illinois.

Many industrial minerals operations qualify for the Illinois Environmental Protection Agency, Bureau of Air's, new "lifetime operating permit," which is available to any permitted operation that produces no more than 11 Mt (12 million short tons) of material per year. The annual fee remained at $100, and operators must comply with all requirements of the State's new Source Performance Standards, 40 CFR 60 Subpart OOO.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN ILLINOIS 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	2,590	186,000 e/	2,690	207,000 e/	2,760	213,000 e/
Clays: Common	100	533	123	560	126	556
Gemstones	NA	8	NA	8	NA	8
Sand and gravel:						
Construction	33,400	143,000	34,100	150,000	34,800	156,000
Industrial	4,610	67,900	4,580	71,100	4,740	70,400
Stone: Crushed	65,700	357,000	72,100 3/	371,000 3/	80,000 3/	422,000 3/
Combined values of clays (fuller's earth), lime, peat, stone [crushed sandstone (1998-99), zinc (1997)], tripoli	XX	73,600	XX	75,400	XX	82,700
Total	XX	829,000	XX	875,000	XX	945,000

e/ Estimated. p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; value included with "Combined values" data.

TABLE 2
ILLINOIS: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	123 r/	50,900 r/	$278,000 r/	$5.45 r/	129	55,100	$291,000	$5.28
Dolomite	25 r/	14,800 r/	79,800 r/	5.38 r/	20	17,000	79,800	4.70
Sandstone	--	--	--	--	1	W	W	W
Total or average	XX	65,700	357,000	5.44	XX	72,100	371,000	5.14

r/ Revised. W Withheld to avoid disclosing company proprietary data. Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	1,500	$8,730	$5.84
Riprap and jetty stone	439	3,620	8.25
Filter stone	478	2,200	4.61
Other coarse aggregate	367	1,860	5.06
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,700	32,800	5.76
Bituminous aggregate, coarse	5,030	32,700	6.50
Bituminous surface-treatment aggregate	1,480	9,030	6.10
Railroad ballast	505	2,930	5.79
Other graded coarse aggregate	1,030	5,540	5.37
Fine aggregate (-3/8 inch):			
Stone sand, concrete	607	2,600	4.29
Stone sand, bituminous mix or seal	W	W	4.64
Screening, undesignated	1,250	4,690	3.75
Other fine aggregate	W	W	5.33
Coarse and fine aggregates:			
Graded road base or subbase	11,200	55,700	4.99
Unpaved road surfacing	2,020	9,490	4.69
Terrazzo and exposed aggregate	20	79	3.93
Crusher run or fill or waste	488	2,320	4.76
Other coarse and fine aggregates	1,760	7,690	4.37
Other construction materials	955	5,670	5.94
Agricultural:			
Agricultural limestone	2,040	8,560	4.19
Poultry grit and mineral food	W	W	12.84
Other agricultural uses	W	W	4.05
Chemical and metallurgical:			
Cement manufacture	2,510	9,930	3.96
Sulfur oxide removal	W	W	9.74
Special: Other fillers or extenders	W	W	W
Other miscellaneous uses: Other specified uses not listed	W	W	W
Unspecified: 3/			
Actual	24,700	111,000	4.51
Estimated	7,200	36,000	5.00
Total or average	72,100	371,000	5.14

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, limestone, and limestone-dolomite; excludes sandstone to avoid disclosing company proprietary data.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
ILLINOIS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	1,540	9,520	84	492	642	3,930	509	2,480
Coarse aggregate, graded 4/	7,580	50,100	W	W	3,340	19,600	W	W
Fine aggregate (-3/8 inch) 5/	1,330	5,320	6	23	596	2,460	257	1,080
Coarse and fine aggregate 6/	8,850	43,900	555	2,820	3,450	17,200	2,600	11,300
Other construction materials	838	5,000	5	18	W	W	W	W
Agricultural 7/	413	1,430	167	1,090	W	W	906	2,810
Chemical and metallurgical 8/	W	W	--	--	1,770	6,790	W	W
Special 9/	--	--	W	W	--	--	--	--
Other miscellaneous uses	W	W	--	--	--	--	--	--
Unspecified: 10/								
Actual	14,100	64,000	2,710	12,000	1,220	5,380	6,660	29,900
Estimated	3,030	15,000	1,860	9,780	1,130	5,570	1,180	6,180
Total	38,400	198,000	5,920	41,100	12,800	64,600	15,000	67,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, limestone, and limestone-dolomite; excludes sandstone to avoid disclosing company proprietary data.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Includes cement manufacture and sulfur oxide removal.

9/ Includes other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	5,470	$22,700	$4.15
Plaster and gunite sands	391	1,800	4.60
Concrete products (blocks, bricks, pipe, decorative, etc.)	1,010	5,300	5.23
Asphaltic concrete aggregates and other bituminous mixtures	1,250	4,780	3.82
Road base and coverings 2/	3,380	18,100	5.34
Fill	2,830	9,680	3.43
Snow and ice control	88	437	4.97
Other miscellaneous uses 3/	79	442	5.59
Unspecified: 4/			
Actual	10,000	42,700	4.27
Estimated	9,590	44,000	4.59
Total or average	34,100	150,000	4.40

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration, railroad ballast, roofing granules, and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
ILLINOIS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	3,000	12,900	404	2,560	1,700	6,300	376	970
Concrete products (blocks, bricks, pipe, decorative, etc.) 2/	1,030	5,260	W	W	319	1,600	W	W
Asphaltic concrete aggregates and other bituminous mixtures	820	3,190	W	W	353	1,390	W	W
Road base and coverings 3/	2,050	11,700	184	1,120	817	4,030	328	1,220
Snow and ice control	75	356	W	W	11	74	W	W
Other miscellaneous uses 4/	1,640	6,060	549	1,450	544	2,130	177	482
Unspecified: 5/	12,000	56,100	2,890	12,500	2,850	10,000	1,890	8,080
Total	20,600	95,600	4,070	17,800	6,590	25,600	2,870	11,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

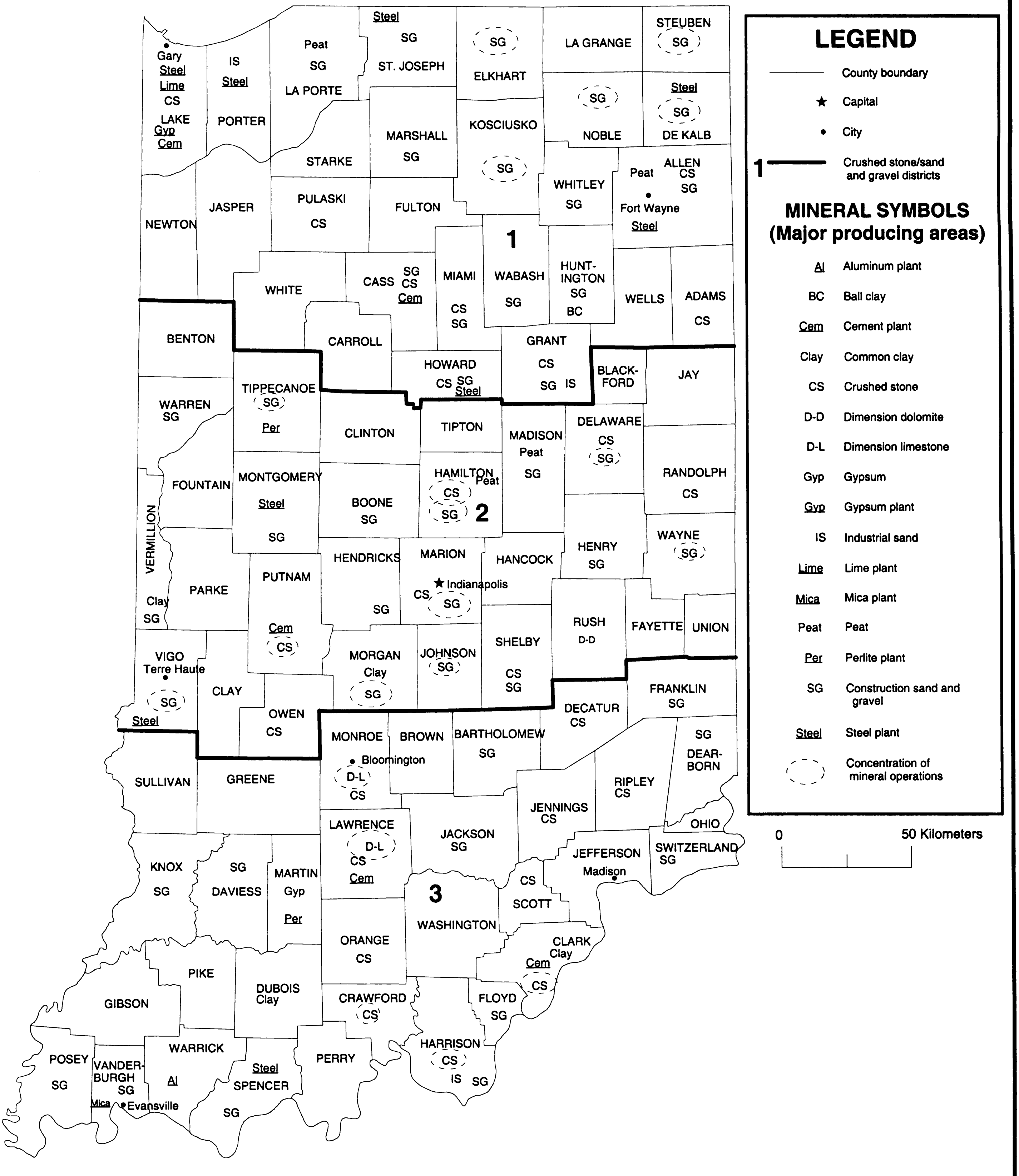
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes fill, filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

INDIANA



Source: Indiana Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF INDIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Indiana Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Indiana was $717 million, according to the U.S. Geological Survey (USGS). This was nearly a 4% increase from that of 1998,[2] and followed a 3.1% increase from 1997 to 1998. The State rose in rank to 19th from 21st among the 50 States in nonfuel mineral production value, of which Indiana accounted for close to 2% of the U.S. total.

Indiana's increase in nonfuel mineral value in 1999 mostly resulted from a $13 million increase in construction sand and gravel, a $9 million rise in crushed stone, and a $5 million increase in portland cement; a smaller yet significant increase occurred in masonry cement. Only lime, dimension stone, and common clays showed decreases in value ($1.5 million or less). In 1998, most nonfuel minerals increased in value, led by a nearly $10 million increase in portland and masonry cements, a $7.9 million rise in construction sand and gravel, and a more than $3 million increase in dimension stone (table 1).

Compared with USGS estimates of the quantities of minerals produced in the other 49 States during 1999, Indiana remained first in dimension stone; one of the top two producing States of masonry cement; fourth in peat; fifth of five States that produce ball clay; and ninth in lime. Additionally, the State was a significant producer of crushed stone, portland cement, common clays, and construction sand and gravel, ranking 11th, 12th, 13th, and 13th, respectively. The State's mines exclusively produce industrial minerals and coal; all raw steel and primary aluminum produced in the State were processed from materials received from other domestic and foreign sources. Indiana continued to lead the Nation in the production of raw steel, with an estimated output of about 23 million metric tons (Mt) of raw steel, as reported by the American Iron and Steel Institute. Based upon USGS data, the State remained third in the production of primary aluminum.

The following narrative information was provided by the Indiana Geological Survey[3] (IGS). Approximately 3,800 persons were employed in the nonfuel mining industry during 1999, an increase of 1.6% over 1998, according to preliminary figures released by the U.S. Mine Safety and Health Administration.

Due to increased demand, several new aggregate operations opened during the year. Some acquisitions also occurred. New crushed stone operations include two Hanson Aggregates Midwest, Inc. quarries, the Woodburn II Quarry in Allen County, the Limedale Quarry in Putnam County, and the J.W. Jones Crushed Stone, Inc. quarry in Putnam County. Mulzer's Crushed Stone, Inc.'s New Amsterdam Quarry, which had been producing temporarily with portable equipment, prepared to officially open its permanent plant. The Indiana Limestone Co., Inc. resumed crushing overburden rock at its dimension stone Crown Quarry in Monroe County with the assistance of a new company, Blackwell Moore, Inc. Martin Marietta Aggregates Inc. made plans to expand its Kentucky Avenue Mine in Marion County. Material Service Corp. of Chicago, IL, acquired two Ward Stone, Inc. quarries, the Francesville Quarry in Pulaski County and the Babcock Quarry in Jasper County. Sand and gravel operations opening during the year include J.W. Jones Crushed Stone, Inc.'s Waverly Pit in Morgan County, and Jones & Sons, Inc.'s Starpoint Pit in Knox County. Two sand and gravel operations in the planning or development stages include an Irving Materials, Inc. pit along Fall Creek in Hancock County, and a second pit for Silver Creek Sand & Gravel Co. in Floyd County. Rogers Group, Inc. will expand its Interstate Sand & Gravel operation in Warren County. Critser Companies, Inc. acquired Bass Lake Sand & Gravel in Starke County and the Hanna Pit in LaPorte County from Hanna Sand & Gravel Co., Inc. Triangle Gravel, Inc. in Warren County was acquired by Salts Sand & Gravel.

Crushed stone quarries closing during 1999 include Irving Materials, Inc. Pipe Creek Stone Co. in Grant County and Stoneco, Inc. Mill Creek Quarry in Miami County. Hanson Aggregates Midwest, Inc.'s Greencastle plant, a fine-ground limestone operation in Putnam County, also closed. Sand and gravel pits closing during the year include Vulcan Materials Co.'s Lafayette and Harner Pits both in Tippecanoe County, Engineering Aggregates Corp.'s O. Wilson Pit in Cass County, and Littleton Sand & Supply in Boone County. There were developments in other industrial minerals industries as well. Indiana Limestone Co. Inc. (producers of Salem Limestone) had a very good year with producers experiencing some trouble in keeping pace with demand for the stone. There has been an increase in the use of limestone for high-end residential construction. Phoenix Limestone Co. closed its quarry in Lawrence County. Dyckerhoff AG, an international cement and building materials company headquartered in Germany, acquired Lone Star Industries, Inc., which operates a plant in Greencastle, Putnam County. The Greencastle plant will undergo a $75 million expansion to be completed by mid-2000, increasing capacity from 540,000 metric tons to 1.22 Mt, adding a new production line and preheater tower and converting to a semidry process. General Shale Products Corp., which operates two neighboring plants in Morgan County, was acquired by the Wienerberger Group, based in Vienna, Austria, in July. In February 1999, the Carmeuse Group and the Lafarge Group finalized the merger combining their U.S. and Canadian lime operations with Carmeuse controlling a 60% and Lafarge a 40% interest. Carmeuse operates the Marblehead lime plant in Lake County. The gypsum industry was also busy with U.S. Gypsum Co. rebuilding and modernizing its plant in East Chicago, Lake County.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Kathryn R. Shaffer, Minerals Statistician, authored the text of State minerals information submitted by the Indiana Geological Survey.

Rogers Group, Inc.'s Greene County Sand & Gravel, near Bloomfield, IN, was awarded a Bronze Environmental Eagle Certificate of Accomplishment by the National Stone Association and the U.S. Environmental Protection Agency for reclamation completed during 1998.

International economic problems led to large quantities of imported steel, adversely affecting domestic steel producers. Qualitech Steel Corp. at Pittsboro in Hendricks County, filed for Chapter 11 bankruptcy protection. The company opened late in June 1998, about the same time the market began to be flooded with low-cost foreign imports. In addition, a damaged furnace shut down the operation for 4 weeks. Qualitech was the fourth U.S. steel company to close during the year, primarily due to the import problem. However, there were several positive developments in the Indiana steel industry during 1999. Steel Dynamics, Inc., which currently operates a minimill near Butler in DeKalb County, plans to build a steel beam mill about 32 kilometers (km) away in Columbia City, Whitley County, with startup planned for the second quarter of 2000. Steel Dynamics, Inc. also operates Iron Dynamics, a plant that produces liquid iron ore for its steel plant at Butler by a coal-based direct-reduction process; it may construct a similar facility for the new steel plant. Heartland Steel Buildings is constructing a $285 million steel plant at Terre Haute, Vigo County, and started the pickling line during the year. The mill is the only one in the world using equipment called Dynamic Shaperoll, which precisely controls the width and thickness of rolled steel. The company plans to build as many as four more plants nationwide if this one is successful. Federal regulators approved the merger of AK Steel Corp. with its former parent company Armco, Inc., based in Pittsburgh, PA, to form the fifth largest steel company in the country. AK Steel Corp. operates a plant in Rockport. New lines were opened at the AK Steel plant, and improvements were made at Bethlehem Steel Corp., Bethlehem Lukens Plate, Ispat Inland Inc., LTV Steel Co., National Steel Corp., and USX Corp. - U.S. Steel Group, Inc., Gary Works. Weirton Steel Corp. with Corus Group PLC formed GalvPro LP, which initiated production in November at a plant producing hot-dipped galvanized steel in Jeffersonville. Indiana's steel industry requested the State revise regulations to allow trucks to carry more weight on Indiana highways.

The Alcoa Inc., which operates a plant in Warrick County, began arrangements to acquire Reynolds Metals Co.

Increased Federal and State funding for road maintenance and improvement led to increased activity in the Indiana aggregates industry during 1999. The State budgeted $709 million in 1999 on road improvements, more than any previous year, with approximately $108 million of that amount being used for interstate improvements. The largest single project was $40 million for the Hoosier Heartland Highway linking Fort Wayne to Lafayette in northern Indiana. Indiana was awarded an additional $2 million of funds from the 1998 national highway bill for the Hoosier Heartland Highway. A $10 million Federal grant for environmental studies related to the extension of I-69 from Indianapolis to Evansville was awarded to Indiana and six other States. Indiana's share of the grant was $1.25 million. The final decision on whether to build the extension and its location should be made in 2002. The Federal Government approved an environmental impact statement for widening and extending U.S. 231 in Spencer County, a $120 million project expected to begin in 2002. The new construction will connect I-64 to the $55.5 million William H. Natcher Bridge over the Ohio River, near Rockport, which is currently under construction. The AK Steel Corp. plant at Rockport will benefit from the area road improvements. The State continued to work on locating sites for two new bridges across the Ohio River in the Jeffersonville, IN, and Louisville, KY, area. In addition, the State announced $200 million over 2 years for Indiana county, city, and town road improvements to be funded from the State's surplus funds. In other construction news, Eli Lilly and Co. announced that it would spend $1 billion over the next 10 years to expand its operations in Indianapolis, a second Toyota plant costing $800 million is planned for the Princeton area, and plans were unveiled for the new $65 million Indiana State Museum in Indianapolis. The Ohio River Greenway Project, which is expected to cost about $36 million, received $3.29 million in Federal funds. The project will include a road, an amphitheater, playgrounds, picnic areas, a bike path, an overlook of the Ohio River, a bridge spanning Silver Creek, a boat ramp, and a walking trail along 11 km of the Ohio River in Clark and Floyd Counties.

No State legislation specific to industrial minerals mining was passed during 1999. However, legislation that permits use of Type III foundry sand for landfills or soil amendments or as an addition to building materials, such as brick and concrete, passed and was signed into law. The Mineral Resources Section of the IGS, with funding from the USGS, is mapping the bedrock geology of the northcentral Heartlands area and the Indianapolis quadrangle at 1:100,000 scale. The IGS is also updating its Directory of Industrial Mineral Producers in Indiana with funding from the Indiana Mineral Aggregates Association using a Global Positioning System to produce more detailed locality maps. The IGS published Miscellaneous Map 41, Map of Indiana Showing Locations of Coal and Industrial Minerals Operations, by N.R. Shaffer, scale 1:500,000, in color. Finally, the Safe, Quiet and Durable Highway Institute will be formed this year at Purdue University with support funds from the Indiana Department of Transportation (INDOT). The Institute will study ways to improve pavements to reduce noise from automobiles and trucks. The Institute will receive matching funds of $3 million by 2003 from INDOT. Other funds will come from Purdue University and industry.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN INDIANA 1/ 2/

(Thousand metric tons and thousand dollars, unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	2,400	168,000 e/	2,500	175,000 e/	2,560	180,000 e/
Clays: Common	947	2,040	681	1,330	684	1,300
Gemstones	NA	3	NA	3	NA	3
Sand and gravel: Construction	21,900	93,100	24,000	101,000	26,500	114,000
Stone:						
Crushed 3/	59,000	281,000 r/	61,600	283,000	62,200	292,000
Dimension metric tons	190,000 3/	24,900 3/	220,000	28,200	223,000	27,300
Combined values of cement (masonry), clays [ball, (1998-99)], gypsum (crude), lime, peat, sand and gravel (industrial), stone [crushed slate, dimension dolomite (1997)]	XX	101,000	XX	102,000	XX	102,000
Total	XX	670,000	XX	691,000	XX	717,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
INDIANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	78 r/	48,800 r/	$228,000 r/	$4.68 r/	80	48,300	$220,000	$4.5
Dolomite	16 r/	10,200 r/	52,400 r/	5.12 r/	17	11,500	51,900	4.52
Traprock	--	--	--	--	1	W	W	W
Slate	1	W	W	W	1	1,900	10,200	5.40
Total or average	XX	59,000	281,000 r/	4.75	XX	61,600	283,000	4.58

r/ Revised. W Withheld from total to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	111	$733	$6.6
Riprap and jetty stone	806	4,330	5.37
Filter stone	275	1,280	4.66
Total or average	1,190	6,340	5.32
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,660	21,400	4.61
Bituminous aggregate, coarse	3,600	17,100	4.76
Bituminous surface-treatment aggregate	3,290	14,000	4.26
Railroad ballast	258	1,090	4.21
Total or average	11,800	53,700	4.55
Fine aggregate (-3/8 inch):			
Stone sand, concrete	238	997	4.19
Stone sand, bituminous mix or seal	112	693	6.19
Screening, undesignated	158	581	3.68
Other fine aggregate	103	909	8.83
Total or average	611	3,180	5.20
Coarse and fine aggregates:			
Graded road base or subbase	3,220	15,600	4.84
Unpaved road surfacing	1,230	6,150	4.98
Crusher run or fill or waste	1,220	5,030	4.11
Lightweight aggregate (slate)	20	110	5.50
Other coarse and fine aggregates	824	3,250	3.94
Total or average	6,520	30,100	4.62
Other construction materials	1,390	7,650	5.51
Agricultural:			
Agricultural limestone	2,820	12,600	4.46
Other agricultural uses	12	39	3.25
Total or average	2,830	12,600	4.45
Chemical and metallurgical:			
Cement manufacture	3,770	15,000	3.98
Dead-burned dolomite manufacture	W	W	3.29
Flux stone	W	W	3.61
Sulfur oxide removal	W	W	4.27
Total or average	4,320	17,300	3.99
Special: Whiting or whiting substitute	(3/)	(3/)	(3/)
Other miscellaneous uses	W	W	3.54
Unspecified: 4/			
Actual	27,900	128,000	4.61
Estimated	4,700	21,700	4.61
Total or average	32,600	150,000	4.61
Grand total or average	61,600	283,000	4.58

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, limestone, limestone-dolomite, and slate; excludes traprock from State to avoid disclosing company proprietary data.

3/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
INDIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	489	2,400	103	737	601	3,210
Coarse aggregate, graded 4/	2,470	11,600	829	4,570	8,510	37,600
Fine aggregate (-3/8 inch) 5/	265	1,160	195	1,360	152	663
Coarse and fine aggregate 6/	2,640	10,600	2,060	10,300	1,820	9,250
Other construction materials	--	--	--	--	1,390	7,650
Agricultural 7/	2,150	10,100	161	704	523	1,780
Chemical and metallurgical 8/	789	2,610	977	3,230	2,550	11,400
Special 9/	--	--	--	--	W	W
Other miscellaneous uses	--	--	--	--	W	W
Unspecified: 10/						
Actual	7,850	36,400	12,300	55,900	7,720	36,200
Estimated	1,290	5,840	668	3,080	2,750	12,800
Total	17,900	80,700	17,300	79,900	26,400	122,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excludes traprock from total to avoid disclosing company proprietary data.

3/ Includes filter stone, macadam, and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes cement manufacture, dead-burned dolomite manufacture, flux stone, and sulfur oxide removal.

9/ Includes whiting or whiting substitute.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	6,040	$23,300	$3.86
Plaster and gunite sands	46	252	5.48
Concrete products (blocks, bricks, pipe, decorative, etc.)	101	532	5.27
Asphaltic concrete aggregates and other bituminous mixtures	1,470	4,680	3.19
Road base and coverings 2/	1,360	5,640	4.16
Fill	1,930	7,710	4.01
Snow and ice control	197	641	3.25
Other miscellaneous uses 3/	328	1,220	3.73
Filtration	32	254	7.94
Unspecified: 4/			
Actual	9,290	44,100	4.75
Estimated	3,220	13,100	4.06
Total or average	24,000	101,000	4.22

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
INDIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	1,530	5,560	2,280	12,000	2,230	5,730
Concrete products (blocks, bricks, pipe, decorative, etc.) 2/	74	322	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	961	2,980	150	456	355	1,250
Road base and coverings 3/	567	2330	912	3,550	72	409
Fill	374	1,270	1,290	5,410	260	1,030
Other miscellaneous uses 4/	335	1,300	W	W	W	W
Unspecified: 5/						
Actual	594	2,250	6,630	32,900	2,070	8,950
Estimated	1,110	4,790	1,170	4,870	941	3,440
Total	5,550	20,800	12,500	59,500	5,970	21,100

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

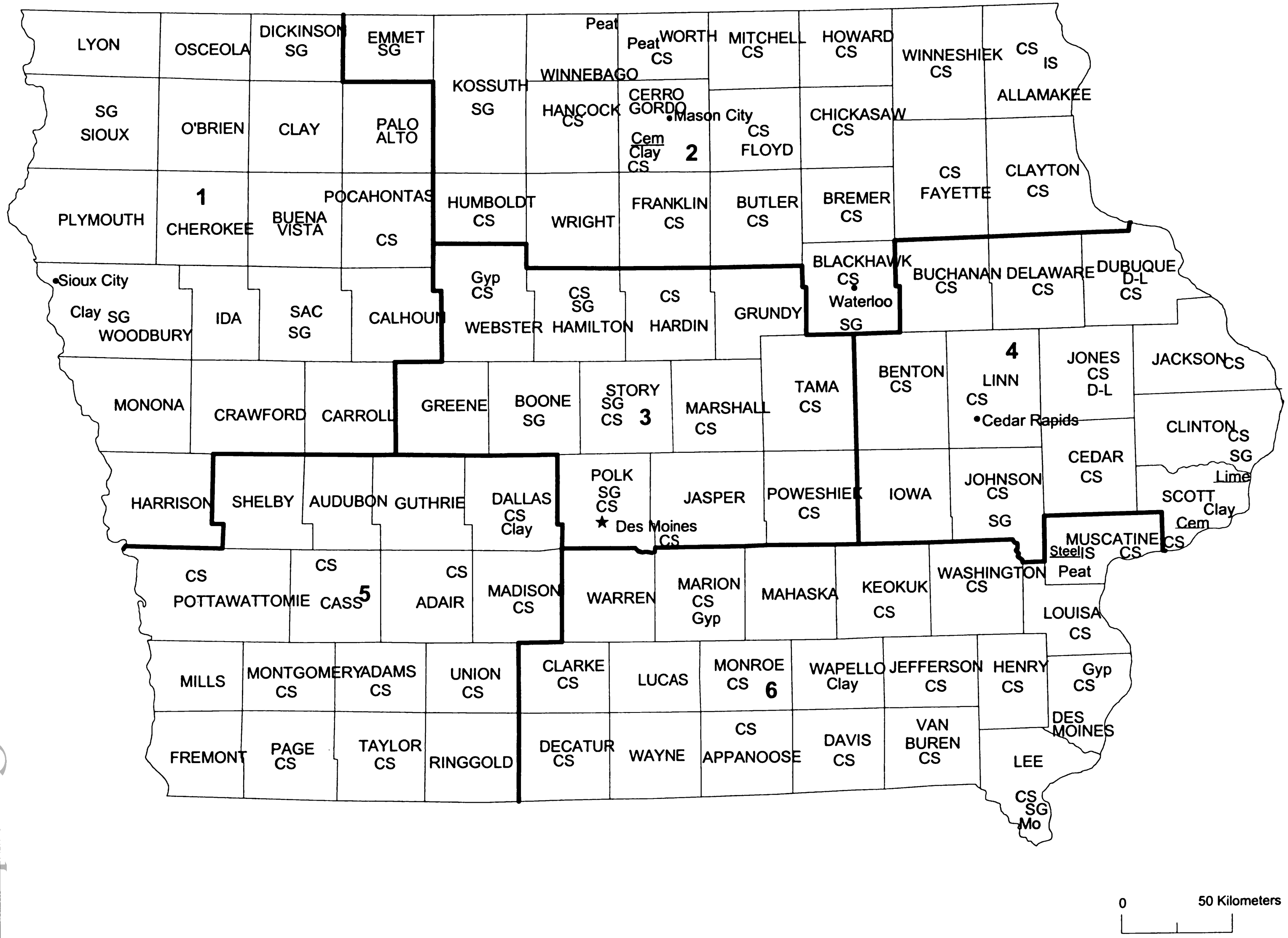
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement) and snow and ice control.

4/ Includes filtration and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

IOWA



LEGEND

―	County boundary
★	Capital
•	City
1 ━	Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-L	Dimension limestone
Gyp	Gypsum
IS	Industrial sand
Lime	Lime plant
Mo	Molybdeum plant
Peat	Peat
SG	Construction sand and gravel
Steel	Steel plant

Source: Iowa Geological Survey Bureau/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF IOWA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Iowa Geological Survey Bureau for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production was $537 million, according to the U.S. Geological Survey (USGS). This was almost a 4% increase from that of 1998,[2] and followed a 6.6% increase in 1998 from that of 1997. Iowa *remained* 27th in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 1% of the U.S. total.

Crushed stone remained the leading commodity, accounting for about 43% of the State's total nonfuel mineral value, followed by portland cement with more than 40% and construction sand and gravel with more than 10%. Most of Iowa's increase in value in 1999 resulted from the increases in crushed stone, up $14 million, and portland cement, up $5 million, and was further supported by smaller increases in lime, industrial sand and gravel, and gypsum. The only significant decrease was a $2 million drop in the value of construction sand and gravel. In 1998, the increased values of portland cement, up $16 million, construction sand and gravel, up $7.2 million, and crushed stone, up $4 million, accounted for most of the State's $32 million increase. Smaller yet significant increases occurred for gypsum and industrial sand and gravel (table 1).

Compared with USGS preliminary estimates of quantities produced in the other 49 States in 1999, Iowa remained second in crude gypsum. Additionally, the State was a significant producer of crushed stone, portland cement (11th), and construction sand and gravel. No metals were mined in Iowa; all of the State's metal production, such as raw steel, resulted from the processing of materials acquired from other domestic and foreign sources.

The Geological Survey Bureau[3] (GSB) of the Iowa Department of Natural Resources provided the following narrative information. During calendar year 1999, Iowa recorded 246 licensed mineral producers operating 1,076 registered mineral production sites in 97 of the State's counties. Of the 246 licensed producers, 11 were operators from outside of Iowa and 30 were Iowa county governments.

The 30 licensed county governments operated a total of 113 registered sites. Of the county operated sites, 13 produced crushed stone, 100 produced sand and gravel, and 1 of these produced crushed stone as well as sand and gravel. Five counties operated crushed stone quarries, and Fayette County, with eight registered sites, operated the greatest number of county licensed quarries. The other 26 county governments operated sand and gravel pits, and Kossuth County, with 10 registered sites, operated the greatest number of county licensed sand and gravel pits.

The greatest number of registered sites and the widest production distribution in any product class was in sand and gravel. Sand and gravel was produced in 86 counties from a total of 615 registered sites. Western Iowa, with its deeply buried bedrock, hosted the top 10 counties in terms of the number of sand and gravel sites. These top 10 western counties had 194 active sand and gravel pits representing approximately 30% of the total number of active sand and gravel pits statewide. Sac County, with 27 registered sand and gravel pits, had more sand and gravel production sites than any other county statewide. Hallett Materials Co. operated the greatest number of sand and gravel sites, with a total of 51 sites distributed across 22 counties.

Crushed stone (mined exclusively from sedimentary limestone and dolostone strata) was produced from 458 registered sites distributed across 66 counties. Of these 458 crushed stone sites, 10 were underground mine operations and the remainder were quarries. Northeastern Iowa, with its readily accessible shallow bedrock, hosted the top 10 counties in terms of the number of crushed stone sites. These top 10 northeastern counties had 241 active quarries, representing 53% of the total number of active crushed stone production sites statewide. Winneshiek County, with 38 registered quarries, had the greatest number of crushed stone sites of all counties statewide. Wendling Quarries, Inc. operated the greatest number of quarries with a total of 62 sites distributed across 11 counties, while Martin Marietta Materials Inc. operated the greatest number of underground mines with 5 mines in 5 counties (Jasper, Marion, Poweshiek, Story, and Webster). The Atlantic underground limestone mine in Cass County, where production was begun in 1997 by Schildberg Construction Co., Inc. of Greenfield, IA, had its second full year of production. The mine operates a 5-meter face, room-and-pillar style, in the Bethany Falls Limestone. This is the first and only underground mine in the State to operate in the Pennsylvanian Period limestones of southwestern Iowa.

Two new underground limestone mines were under development during 1999: the Lyle Mine in Keokuk County, operated by Douds Stone Co., and the Laughlin Mine in Marion

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Robert M. McKay, Research Geologist, authored the text of minerals industry information provided by the Iowa Geological Survey Bureau.

County, operated by Bruening RK Products, Inc. Both mines were constructing declines from existing quarries down to Mississippian limestone and dolostone strata during the year. The Lyle Mine will operate primarily within the Burlington Formation, while the Laughlin Mine's initial mining level is the Spergen Formation with future potential for mining deeper horizons. Both mines are expected to reach normal production status during 2000.

Crude gypsum was produced in 3 counties by 5 companies operating a total of 14 sites. The U.S. Gypsum Co., having the largest number of production sites, operated at 7 of these 14 sites with 6 quarries in Webster County and 1 underground mine in Des Moines County. Webster County remained the leader in terms of the number of gypsum mines, with 12 quarries operated by 3 companies. National Gypsum Co. embarked upon a major expansion of its Kaufmann-George Quarry in the northern part of the district.

Clay was produced at 11 sites in 6 counties by 7 companies. Clay used in the manufacture of portland cement was mined at six pits in Cerro Gordo and Scott Counties, and clay used for other products (primarily brick) was taken from four pits in Dallas, Woodbury, and Webster Counties. Clay was mined at one registered site for fill material.

In August, the GSB completed a new open file map entitled "Surficial Geology of the Des Moines Lobe of Iowa: Hancock, Kossuth, Winnebago and Wright Counties." The map, prepared at a scale of 1:100,000, delineates areas of potential sand and gravel resources along outwash terraces and upland landscape positions on Wisconsinan age glacial deposits of the Des Moines Lobe in north-central Iowa. The four-county mapping project was partially sponsored and funded by the USGS National Cooperative Geologic Mapping Program. The map is available from the GSB as Open File Map 99-1.

In other news related to the Iowa mineral industry, Terex Corp., a diversified global manufacturer of construction and mining-related capital equipment based in Westport, CT, finalized the purchase of Cedarapids, Inc., a Raytheon Co. subsidiary, for $170 million. Cedarapids, based in Cedar Rapids, IA, is a designer, manufacturer, and marketer of mobile crushing and screening equipment, asphalt pavers, and asphalt material mixing plants.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN IOWA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Cement: Portland	2,550	195,000 e/	2,610	211,000 e/	2,680	216,000 e/
Clays: Common	287	976	301	1,040	305	1,010
Gemstones	NA	91	NA	4	NA	2
Gypsum, crude	2,080	12,200	W	W	W	W
Sand and gravel: Construction	12,600	51,300	13,500	58,500	12,800	56,400
Stone: Crushed	37,300	215,000	41,800	219,000	43,400	233,000
Combined values of cement (masonry), lime, peat, sand and gravel (industrial), and values indicated by symbol W	XX	12,500	XX	27,700	XX	29,700
Total	XX	486,000	XX	518,000	XX	537,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
IOWA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone 2/	198	37,200	$215,000	$5.77	216	41,700	$219,000	$5.25
Dolomite	1	41	141	3.45	4	72	299	4.15
Total or average	XX	37,300	215,000	5.76	XX	41,800	219,000	5.25

XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	231	$889	$3.85
Riprap and jetty stone	87	485	5.57
Filter stone	507	1,860	3.68
Other coarse aggregate	66	526	7.97
Total or average	891	3,760	4.22
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,150	6,630	5.77
Bituminous aggregate, coarse	436	2,780	6.37
Bituminous surface-treatment aggregate	82	501	6.11
Railroad ballast	1	6	6.00
Other graded coarse aggregate	78	500	6.41
Total or average	1,750	10,400	5.97
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.02
Stone sand, bituminous mix or seal	89	487	5.47
Screening, undesignated	306	1,240	4.05
Total or average	W	W	W
Coarse and fine aggregates:			
Graded road base or subbase	1,470	8,790	5.97
Unpaved road surfacing	4,390	22,400	5.11
Crusher run or fill or waste	540	2,020	3.74
Total or average	6,400	33,200	5.19
Other construction materials	112	755	6.74
Agricultural:			
Agricultural limestone	741	3,090	4.16
Poultry grit and mineral food	W	W	3.30
Other agricultural uses	40	132	3.30
Total or average	W	W	W
Chemical and metallurgical:			
Cement manufacture	2,310	7,630	3.31
Lime manufacture	(3/)	(3/)	4.27
Flux stone	(3/)	(3/)	6.54
Total or average	4,320	17,300	3.99
Special:			
Asphalt fillers or extenders	(3/)	(3/)	17.94
Roofing granules	(3/)	(3/)	9.76
Total or average	117	1,180	10.11
Other miscellaneous uses	189	1,650	8.74
Unspecified: 4/			
Actual	14,800	82,500	5.59
Estimated	13,300	69,100	5.20
Total or average	28,000	152,000	5.41
Grand total or average	41,800	219,000	5.25

W Withheld to avoid disclosing company proprietary data; included in "Grand total or average."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, limestone, and limestone-dolomite.

3/ Withheld to avoid disclosing company proprietary data; included in "Total or average."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
IOWA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5		District 6		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:														
Coarse aggregate (+1 1/2 inch) 2/	--	--	(3/)	(3/)	W	W	548	2,060	--	--	185	976	--	--
Coarse aggregate, graded 4/	--	--	(3/)	(3/)	W	W	779	4,180	--	--	351	2,220	--	--
Fine aggregate (-3/8 inch) 5/	--	--	161	700	W	W	103	429	--	--	83	464	--	--
Coarse and fine aggregate 6/	--	--	(3/)	(3/)	W	W	2,430	10,700	--	--	1,930	12,400	--	--
Other construction materials	--	--	(3/)	(3/)	400	1,920	23	75	--	--	--	--	--	--
Agricultural 7/	--	--	300	1,440	314	1,070	273	946	--	--	126	524	--	--
Chemical and metallurgical 8/	--	--	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)	--	--	--	--	--	--
Special 9/	--	--	--	--	--	--	(3/)	(3/)	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	(3/)	(3/)	161	1,530	--	--	28	122	--	--
Unspecified: 10/														
Actual	1,310	7,200	1,810	9,950	5,510	30,400	1,820	10,000	639	3,520	2,640	14,600	1,030	6,820
Estimated	--	--	2,920	15,700	212	1,100	2,730	13,200	6,470	35,400	945	3,640	--	--
Total	1,310	7,200	8,960	46,300	6,450	34,500	10,600	50,400	7,110	39,000	6,290	34,900	1,030	6,820

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes macadam, riprap, and jetty stone.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and screening (undesignated).

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, and unpaved road surfacing.

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes cement manufacture, chemical stone or alkali works, flux stone, and lime manufacture.

9/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, whiting or whiting substitute, and other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,310	$10,400	$4.49
Plaster and gunite sands	64	345	5.39
Concrete products (blocks, bricks, pipe, decorative, etc.)	39	222	5.69
Asphaltic concrete aggregates and other bituminous mixtures	605	1,970	3.26
Road base and coverings 2/	1,930	5,920	3.07
Fill	896	2,530	2.82
Snow and ice control	93	365	3.92
Roofing granules	1	13	13.00
Other miscellaneous uses	69	610	8.84
Unspecified: 3/			
Actual	3,330	18,300	5.50
Estimated	4,180	17,900	4.28
Total or average	13,500	58,500	4.33

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
IOWA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	534	2,180	564	3,000	177	787
Plaster and gunite sands	17	82	W	W	2	12
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	14	65
Asphaltic concrete aggregates and other bituminous mixtures	W	W	97	470	306	819
Road base and coverings 2/	1,000	3,120	296	899	553	1,650
Fill	165	471	174	566	99	349
Snow and ice control	12	39	W	W	17	66
Other miscellaneous uses 3/	--	--	W	W	33	323
Unspecified: 4/						
Actual	1,060	7,070	411	2,030	1,110	5,820
Estimated	878	3,310	343	1,830	2,420	10,500
Total	3,850	16,800	1,970	9,360	4,740	20,400

	Districts 4 and 5		District 6	
	Quantity	Value	Quantity	Value
Concrete aggregates	646	2,710	389	1,700
Plaster and gunite sands	39	198	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	3	42	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	22	138
Road base and coverings 2/	W	W	W	W
Fill	104	304	353	837
Snow and ice control	W	W	--	--
Other miscellaneous uses 3/	--	--	W	W
Unspecified: 4/				
Actual	185	735	558	2,630
Estimated	394	1,670	146	610
Total	1,480	6,010	1,470	5,910

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

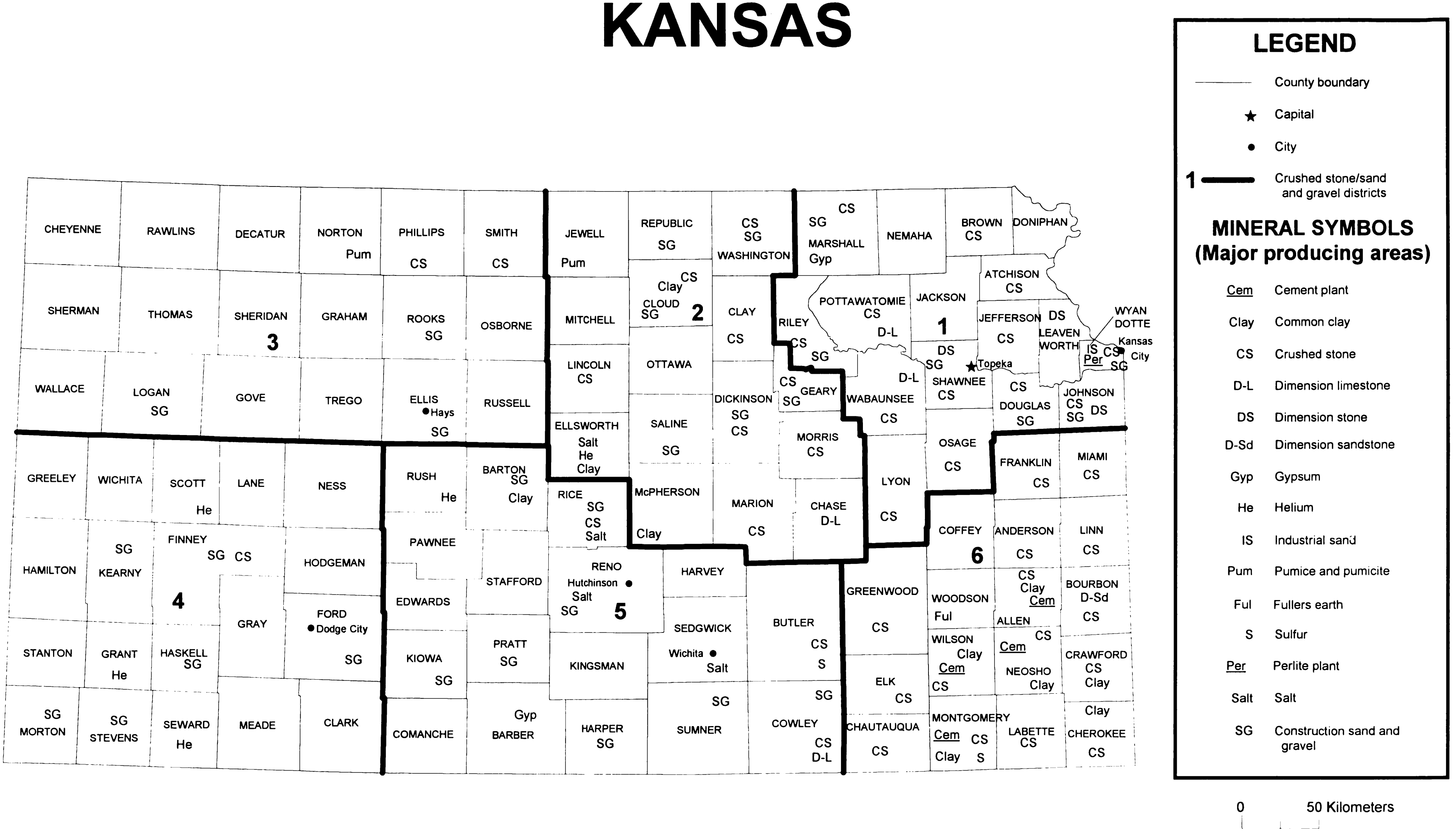
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes roofing granules and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

KANSAS



Source: Kansas Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF KANSAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kansas Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Kansas was $566 million, according to the U.S. Geological Survey (USGS). This was a 2.7% increase from that of 1998,[2] following a 2.2% increase from 1997 to 1998. The State increased in rank to 25th from 26th among the 50 States in total nonfuel mineral production value, of which Kansas accounted for nearly 1.5% of the U.S. total.

Portland cement, salt, crushed stone, and grade-A helium were Kansas' leading nonfuel mineral commodities, accounting for about 25%, 21%, and the latter two 20%, respectively, of the State's total nonfuel mineral production value. In 1999, increases in the values of crude helium (up more than $15 million), portland cement, and grade-A helium accounted for most of the State's rise in value. Only construction sand and gravel, down about $6 million, showed any significant drop in value. (All mineral commodity listings are by descending order of value or change in value.) In 1998, increases in portland cement and grade-A helium were offset somewhat by a $13 million decrease in crude helium; all other changes in nonfuel mineral values were relatively small (table 1).

Production of nonfuel minerals in Kansas consisted entirely of industrial minerals; no metals were mined in the State. Based upon USGS estimates of the quantities produced in 1999 in the 50 States, Kansas continued as the Nation's leading producer of crude and grade-A helium and remained fifth in salt, sixth in pumice and pumicite, and ninth in crude gypsum and fuller's earth. Additionally, significant quantities of portland cement, crushed stone, common clays, and dimension stone were produced in the State.

The following narrative information was provided by the Kansas Geological Survey[3] (KGS). According to the Kansas Aggregate Producers Association (KAPA), aggregate production—particularly construction sand and gravel, declined due to three factors:

(1) There was a temporary slump in demand due to a transition between the 1998 and 1999 highway programs. The States 8-year comprehensive highway program ended in 1998. It is anticipated that aggregate production next year will show an increase as the new 10-year highway program is implemented.

(2) The Kansas Department of Transportation is using more Superpave specifications (Federal Highway Administration standards) in their mix designs. The sand content is lower in these mixes.

(3) The U.S. Army Corps of Engineers continues to lower the quotas of sand and gravel dredged from the Kansas River.

A major acquisition within the State's sand and gravel industry occurred when Holliday Sand & Gravel Co., located in Overland Park, Johnson County, acquired both Victory Sand Co., operating in Topeka, and Builders Sand Co., operating near the Kansas City area. The Victory name will be retained while the other operations in the DeSoto/Bonner Springs area will adopt the Holliday Sand & Gravel name.

Further major consolidation in the aggregate industry occurred when Shears Construction LP, located in Hutchinson, Reno County, acquired the operations of Allied, Inc., located in Hays, Ellis County. Allied continued to operate as a separate entity. Late in the year, Shears and Couch Construction Materials (the aggregate portion of Shears) was acquired by APAC-Kansas, Inc., located in Overland Park, Johnson County.

O'Brien Ready Mix Co., headquartered in St. Paul, Neosho County, expanded its presence in southeastern Kansas by acquiring Cullor, Inc., located in Fort Scott, Bourbon County. Cullor had provided crushed stone in the area for over 50 years.

Early in the year, the Governor released a proposed transportation plan that included $2.4 billion in additional revenue. According to KAPA, the plan could be funded by transferring 10% of existing sales tax receipts to the State Highway Fund and by long-term debt financing (25-year bonds) of $1.8 billion. While this was short of the Transportation-2000 Plan Task Force goal that called for $1.552 billion per year compared to the Governor's plan of $1.335 billion per year, it would not require a tax increase, a feature that appealed to many lawmakers. Others were concerned that this would be an insufficient amount, while still others were concerned about the long-term debt. During the legislative session, House and Senate committees debated and passed somewhat different versions, but on April 30, a compromise version passed both houses and was signed by the Governor on May 10. The final version of the Kansas Comprehensive Transportation Plan includes $12.6 billion over a 10-year period, and will be funded by increases in motor fuel taxes; a 15% increase in vehicle registration fees in 2000, with an additional 5% in 2004; 20-year bonds; and general fund transfers.

Four county governments have opened their crushed rock operations for commercial purposes. They are competing with the State's private producers as well as producers in other

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] David A. Grisafe, Industrial Minerals Specialist with the Kansas Geological Survey authored the text of the minerals industry information submitted by that agency.

States. KAPA is exploring whether it is legal for a governmental body to compete with the private industry.

KGS updated its Directory of Industrial Mineral Producers using records from KGS and the State Conservation Commission (KGS Open-File Report 99-46). The directory, arranged alphabetically by county, lists the commodities produced; the name, address, and telephone number of each producer; and, the legal description for each mine, pit, or quarry. The directory is also available on the internet at the KGS web site: http://www.kgs.ukans.edu. It can be searched by commodity or county. The latitude and longitude are also given for each operation, based upon the center point of each lease. The KGS also issued a State map (Map M-63) showing the locations of active industrial mineral mining operations.

A total of 59 open-file reports (OFR) covering a variety of topics were completed in 1999 and can be accessed at the KGS library. In addition to the directory of industrial mineral producers, preliminary field geology maps were completed for six quadrangles in Bourbon County (KGS OFR 99-13), as well as a geologic map of the Atchison West and East Quadrangles in Atchison County (KGS OFR 99-38). KGS OFR 99-54 shows both the active and abandoned pit and quarry locations in the Manhattan Quadrangle (scale 1:250,000). The results of testing ethyl silicate solution to improve the strength and freeze-thaw resistance of the Ravenscroft Sandstone at St. Victor Provincial Petroglyph Park, Saskatchewan, Canada, are given in OFR 99-42. A similar study for strength improvement using sandstone from the Castle Butte petroglyph area, Montana, is given in OFR 99-41. Finally, OFR 99-18 is a field guide for the Kansas Earth Resources Field Project held in 1999 in Southeast Kansas. The report addresses mining, water, and environmental issues in the area.

The KGS also published a Primer of Industrial Minerals for Kansas (Kansas Geological Survey: Educational Series 13). The 28-page book is not technical, and is intended for the general public.

The KGS continued its multiyear program to remap much of the State. Active mapping was ongoing in Atchison, Bourbon, Cherokee, Coffey, Comanche, Ford, Hamilton, Kearny, Marshall, Neosho, Republic, Sedgwick, and Wilson Counties. Field mapping was completed in Bourbon, Cherokee, Coffey, Comanche, Hamilton, Kearny, Neosho, and Wilson Counties. Final geologic maps were issued for Greenwood (Map M-50), Labette (Map M-48), Leavenworth (Map M-53), Woodson (Map M-52), and Wyandotte (Map M-58) Counties.

The KGS also publishes Public Information Circulars (PIC) that are informative, short publications for the general public at no charge. In 1999, PIC-13, titled "Landslides in Kansas," was published. The KGS also released the I-70 brochure. It describes the general geology along the east-west interstate across Kansas.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KANSAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland		1,690	122,000 e/	1,800	138,000 e/	1,850	142,000 e/
Clays: Common		545	2,500	585	2,510	588	2,450
Gemstones		NA	291	NA	29	NA	21
Helium: Grade-A	million cubic meters	51	101,000	56	110,000	57	112,000
Salt		3,210	120,000	3,090	120,000	3,100	121,000
Sand and gravel: Construction		11,200	31,600	10,800	31,400	8,410	25,000
Stone:							
Crushed		23,000	116,000	21,800	115,000	21,300	115,000
Dimension	metric tons	21,000 3/	1,710 3/	15,800	1,240	13,700	1,510
Combined values of cement (masonry), clays (fuller's earth), gypsum (crude), helium (crude), pumice and pumicite, sand and gravel (industrial), stone [dimension sandstone (1997)]		XX	44,200	XX	31,400	XX	46,800
Total		XX	539,000	XX	551,000	XX	566,000

e/ Estimated. p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" figure.

TABLE 2
KANSAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	158	22,300	$114,000	$5.11	144	21,200	$109,000	$5.15
Sandstone and quartzite	3	W	W	W	3	W	W	W
Miscellaneous stone	1	W	W	W	1	W	W	W
Total or average	XX	23,000	116,000	5.04	XX	21,800	115,000	5.28

W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$6.54
Riprap and jetty stone	119	930	7.81
Filter stone	169	1,070	6.31
Other coarse aggregate	266	1,600	6.03
Coarse aggregate, graded:			
Concrete aggregate, coarse	334	2,830	8.48
Bituminous aggregate, coarse	676	5,420	8.02
Bituminous surface-treatment aggregate	W	W	7.43
Other graded coarse aggregate	2,220	15,000	6.76
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	6.96
Screening, undesignated	710	5,160	7.26
Other fine aggregate	325	744	2.29
Coarse and fine aggregate:			
Graded road base or subbase	1,080	5,510	5.10
Unpaved road surfacing	394	1,710	4.35
Crusher run or fill or waste	111	730	6.58
Other coarse and fine aggregates	2,900	16,300	5.62
Other construction materials	755	4,010	5.31
Agricultural:			
Agricultural limestone	197	1,130	5.72
Other agricultural uses	14	68	4.86
Chemical and metallurgical: Cement manufacture	2,050	8,070	3.94
Special:			
Other fillers or extenders	1	5	5.10
Roofing granules	W	W	7.96
Other miscellaneous uses:			
Waste material	5	11	2.15
Other specified uses not listed	5	22	4.45
Unspecified: 3/			
Actual	5,560	26,600	4.77
Estimated	3,780	17,200	4.55
Total or average	21,800	115,000	5.28

W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone, limestone-dolomite, miscellaneous stone, and sandstone and quartzite.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
KANSAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 3/	216	1,400	112	831	--	--	W	W	174	1,060
Coarse aggregate, graded 4/	1,980	13,500	698	6,810	--	--	--	--	567	3,080
Fine aggregate (-3/8 inch) 5/	650	3,350	250	2,000	--	--	W	W	163	547
Coarse and fine aggregate 6/	1,490	9,020	751	3,990	W	W	466	2,200	1,770	9,450
Other construction materials	--	--	--	--	--	--	--	--	760	4,020
Agricultural 7/	42	267	14	82	--	--	--	--	155	846
Chemical and metallurgical 8/	--	--	--	--	--	--	--	--	2,050	8,070
Special 9/	--	--	--	--	--	--	--	--	1	5
Other miscellaneous uses	--	--	--	--	W	W	--	--	5	22
Unspecified: 10/										
Actual	2,730	13,500	1,170	5,440	--	--	W	W	1,490	6,720
Estimated	1,550	7,180	--	--	W	W	W	W	2,130	9,570
Total	8,660	48,400	3,000	19,100	168	613	735	3,630	9,260	43,400

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No crushed stone reported for District 4.

3/ Includes macadam, riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated).

6/ Includes graded road base or subbase, unpaved road surfacing, terrazzo and exposed aggregates, and crusher run (select material or fill).

7/ Includes agricultural limestone and other agricultural uses.

8/ Includes cement manufacture, lime manufacture, flux stone, and chemical stone or alkali works.

9/ Includes mine dusting or acid water treatment, asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	2,300	$6,970	$3.03
Plaster and gunite sands	74	202	2.73
Asphaltic concrete aggregates and other bituminous mixtures	1,180	3,790	3.20
Road base and coverings 2/	1,900	5,220	2.76
Fill	807	1,560	1.93
Snow and ice control	59	196	3.32
Other miscellaneous uses	(3/)	2	16.59
Unspecified: 4/			
Actual	1,040	3,810	3.67
Estimated	3,440	9,670	2.81
Total or average	10,800	31,400	2.91

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Less than 1/2 unit.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
KANSAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	342	1,330	W	W	192	849	1,360	3,440
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	51	150	108	582	848	2,440
Road base and coverings 3/	57	473	250	899	399	752	746	1,700	443	1,400
Fill	147	317	92	271	15	41	81	249	474	677
Other miscellaneous uses 4/	5	17	W	W	W	W	17	63	12	40
Unspecified: 5/										
Actual	977	3,670	--	--	24	71	--	--	38	72
Estimated	1,590	4,970	189	561	26	43	373	1,030	1,260	3,070
Total	3,270	11,100	986	3,420	593	1,280	1,520	4,480	4,430	11,100

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

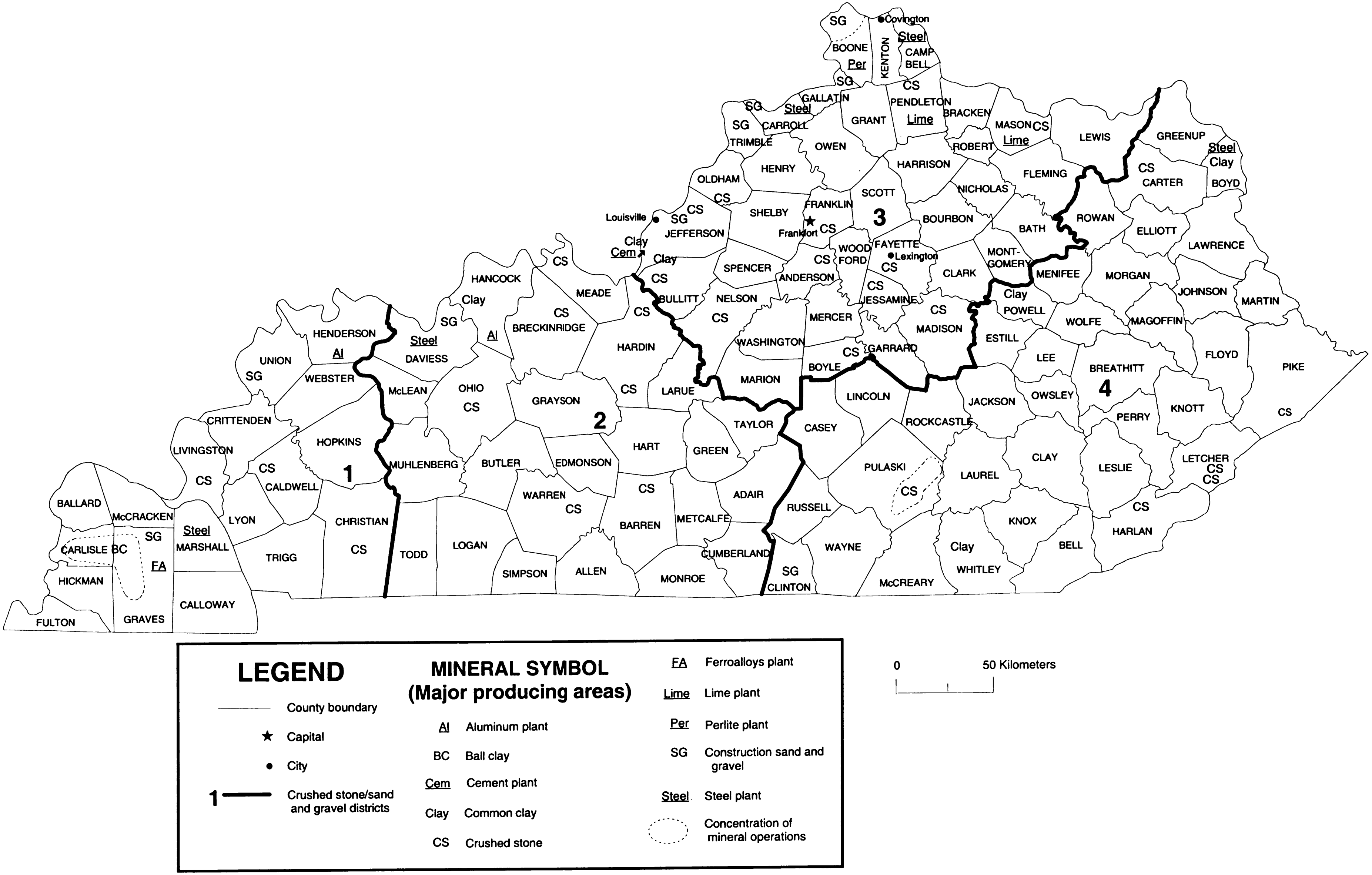
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

KENTUCKY



Source: Kentucky Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF KENTUCKY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Kentucky Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Kentucky was $510 million, according to the U.S. Geological Survey (USGS). This was about a 2% increase from that of 1998,[2] and followed 2 years with the same value of $498 million. Kentucky remained 29th among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 1% of the U.S. total.

Crushed stone continued as Kentucky's leading nonfuel mineral commodity in 1999, accounting for about 58% of the State's nonfuel mineral production value. Lime was second and portland cement was third. Kentucky's increase in nonfuel mineral value in 1999 resulted mostly from $4 million, $3 million, and $2.6 million increases, respectively, in the values of lime, crushed stone, and construction sand and gravel. Most of the State's mineral commodities increased in value except for common clays, which showed a small decrease, and gemstones, which was unchanged. In 1998, increases in the values of lime and construction sand and gravel balanced out decreases in the values of gemstones, portland cement, and crushed stone (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States during 1999, Kentucky remained 2d in lime, 3d in ball clay, 5th in fire clay, and in a virtual tie with Colorado for 10th in gemstones. Additionally, the State produced significant quantities of crushed stone and common clays. Primary aluminum and raw steel were produced from materials obtained from other domestic and foreign sources. Based upon preliminary estimates, Kentucky remained the Nation's second leading producer of primary aluminum.

In recent years, Kentucky has been entirely an industrial mineral-producing State. Ivernia West plc. completed a lease agreement on about 4,000 hectares in the Paducah area of western Kentucky to begin exploring (spring 2000) what the company thinks is a massive zinc sulfide area (Plachy, 2000). The last year in which any metal was mined was 1990, when small quantities of zinc and fluorspar were recovered from surface ore at the Lafayette Mine in Crittenden County.

The following narrative information was provided by the Kentucky Geological Survey (KGS).[3] Crushed stone and brick producers visited by the KGS during 1999 reported a large demand for construction materials. Anticipating continuing strong demand for construction stone, several companies conducted exploratory development drilling in central and eastern Kentucky. Sterling Materials Co. completed its first full year of operation at its mine in Gallatin County. Sterling Materials produced crushed stone for the northern Kentucky market from limestone mined from the High Bridge Group (Ordovician) at a depth of about 150 meters. Production in 1999 was about one-half of the operation's designed capacity (Drake, 2000). Hanson Building Materials America acquired the North American Brick Group of Jannock Limited. The purchase included brick plants in Boyd and Powell Counties (Drake, 1999).

Lafarge Corp. broke ground for a new wallboard manufacturing plant at Silver Grove on the Ohio River in Campbell County. With annual production of about 83 million square meters of wallboard, the plant will be the largest single-line wallboard production facility in the United States. The facility will use synthetic gypsum, a byproduct from the Zimmer powerplant in Moscow, OH (North American Quarry News, 1999). Louisville Gas and Electric Co. started providing synthetic gypsum to U.S. Gypsum Co. The gypsum is a byproduct of the limestone-based flue-gas desulfurization system at the utility's Mill Creek powerplant in Jefferson County.

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North American Quarry News, 1999, North American Quarry News, Palatine Bridge, NY, August, v. 1, p. 22.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at http://minerals.usgs.gov/minerals/contacts/comdir.html; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change, while related rankings may also be subject to change.

[3] Garland Dever, Jr., Geologist, submitted the text of information provided by the Kentucky Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN KENTUCKY 1/ 2/

(Thousand metric tons and thousand dollars)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	865	3,910	872	3,930	877	3,840
Gemstones	NA	3,520	NA	263	NA	263
Sand and gravel: Construction	8,140	26,600	8,100	27,500	8,700	30,100
Stone: Crushed 3/	63,200 r/	294,000 r/	59,500	291,000	60,500	294,000
Combined values of cement, clays (ball, fire), lime, stone [crushed sandstone (1997-98) crushed miscellaneous (1999)]	XX	172,000	XX	175,000	XX	181,000
Total	XX	500,000 r/	XX	498,000	XX	510,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	92 r/	63,200 r/	$294,000 r/	$4.65	92	59,500	$291,000	$4.88
Sandstone	1	W	W	W	--	--	--	--
Miscellaneous stone	--	--	--	--	1	W	W	W
Total or average	XX	63,200 r/	294,000 r/	4.65	XX	59,500	291,000	4.88

r/ Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	71	$523	$7.37
Riprap and jetty stone	456	3,150	6.90
Filter stone	486	2,720	5.59
Other coarse aggregate	1,240	6,050	4.87
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,980	11,600	5.86
Bituminous aggregate, coarse	3,130	20,600	6.57
Bituminous surface-treatment aggregate	948	5,810	6.12
Railroad ballast	179	1,040	5.79
Other graded coarse aggregate	2,520	16,300	6.48
Fine aggregate (-3/8 inch):			
Stone sand, concrete	152	876	5.76
Stone sand, bituminous mix or seal	775	4,500	5.81
Screening, undesignated	735	3,800	5.17
Other fine aggregate	1,120	6,100	5.46
Coarse and fine aggregate:			
Graded road base or subbase	3,080	17,600	5.72
Unpaved road surfacing	435	2,280	5.25
Crusher run or fill or waste	677	2,770	4.09
Other coarse and fine aggregates	1,750	9,670	5.52
Agricultural limestone	333	1,860	5.60
Chemical and metallurgical:			
Cement manufacture	W	W	3.09
Lime manufacture	W	W	3.31
Flux stone	W	W	4.50
Sulfur oxide removal	W	W	14.33
Special: Mine dusting or acid water treatment	W	W	13.45
Other miscellaneous uses:			
Pipe bedding	3	24	7.92
Other specified uses not listed	W	W	W
Unspecified: 3/			
Actual	21,800	104,000	4.77
Estimated	11,600	48,200	4.15
Total or average	59,500	291,000	4.88

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes limestone; excludes miscellaneous stone from total to avoid disclosing company proprietary data.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
KENTUCKY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	762	4,880	509	2,700
Coarse aggregate, graded 4/	W	W	W	W	3,280	22,100	1,860	9,890
Fine aggregate (-3/8 inch) 5/	W	W	W	W	1,010	5,310	463	2,360
Coarse and fine aggregate 6/	W	W	W	W	3,050	17,300	1,010	4,890
Other construction materials	5,030	29,300	1,300	16,600	3	24	--	--
Agricultural 7/	--	--	(8/)	(8/)	150	979	52	229
Chemical and metallurgical 9/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Special 10/	--	--	--	--	(8/)	(8/)	--	--
Other miscellaneous uses 11/	--	--	--	--	1	2	--	--
Unspecified: 12/								
Actual	13,800	67,200	1,660	7,670	4,960	22,600	1,420	6,560
Estimated	191	842	3,720	14,500	3,840	15,900	3,870	17,000
Total	19,000	97,400	9,570	43,700	21,800	106,000	9,200	43,600

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excludes miscellaneous stone from total to avoid disclosing company proprietary data.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture, lime manufacture, flux stone, and sulfur oxide removal.

10/ Includes mine dusting or acid water treatment.

11/ Includes other specified uses not listed.

12/ Reported and estimated production without a breakdown by end use.

TABLE 5
KENTUCKY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,090	$3,840	$3.52
Asphaltic concrete aggregates and other bituminous mixtures	141	449	3.18
Road base and coverings	78	223	2.86
Fill 3/	259	1,750	6.76
Unspecified: 4/			
Actual	1,090	2,850	2.60
Estimated	5,440	18,400	3.38
Total or average	8,100	27,500	3.39

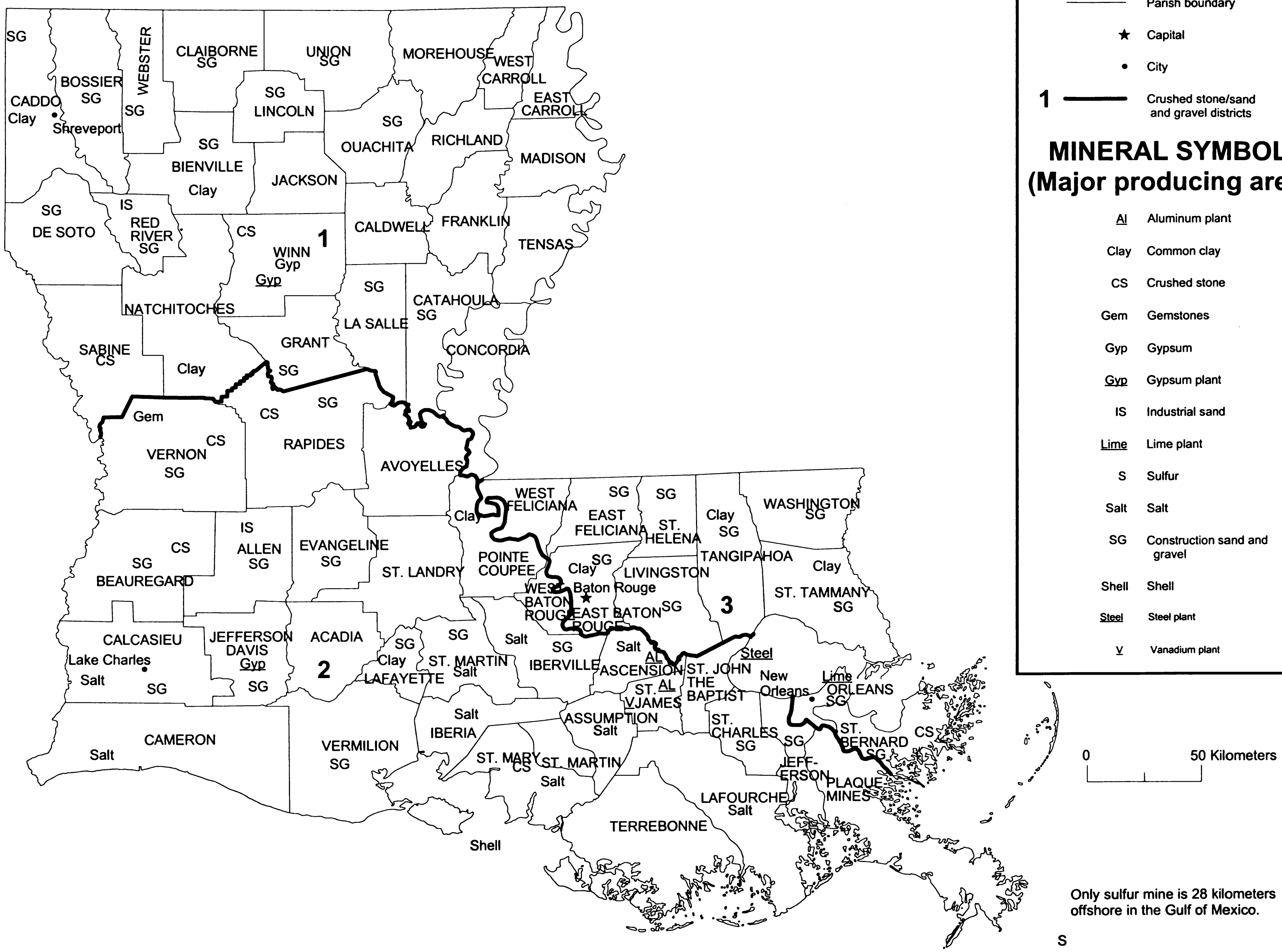
1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

LOUISIANA



LEGEND

—	Parish boundary
★	Capital
•	City
1 ━━	Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant
Clay	Common clay
CS	Crushed stone
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Lime	Lime plant
S	Sulfur
Salt	Salt
SG	Construction sand and gravel
Shell	Shell
Steel	Steel plant
V	Vanadium plant

Only sulfur mine is 28 kilometers offshore in the Gulf of Mexico.

Source: Louisiana Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF LOUISIANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Louisiana Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Louisiana was $348 million, according to the U.S. Geological Survey (USGS). This was a marginal increase from that of 1998,[2] following a 14% decrease from 1997 to 1998. The State rose in rank to 33d from 34th among the 50 States in total nonfuel mineral production value, of which Louisiana accounted for nearly 1% of the U.S. total.

Louisiana's leading nonfuel mineral is salt, accounting for nearly 52% of the State's nonfuel mineral value in 1999. When included as part of Louisiana's mineral production, sulfur is the State's second-leading mineral commodity. All current sulfur production comes from a mine that is 28 kilometers offshore. Because of the mine's location, the State does not receive severance tax income or mineral production royalties; instead, they are collected by the Federal Government. Since 1991, the State and the Louisiana Geological Survey have not included the sulfur as part of Louisiana's nonfuel mineral production; consequently, it is not cited in table 1 under "Combined values." The USGS attributes this offshore sulfur production to Louisiana, because it is the State nearest to the sulfur mine and because Freeport-McMoRan Sulphur Inc., the company that operates the mine, is based in New Orleans.

In 1999, the value of salt increased by about $7 million, but decreases in construction sand and gravel and crushed sandstone reduced the overall gain, resulting in a marginal increase in nonfuel mineral value for the State. All other changes in value were small. In 1998, a substantial decrease in the value of Frasch sulfur and a smaller yet significant drop in the value of crushed stone accounted for most of the decrease in nonfuel mineral value. International cutbacks and two hurricanes that caused significant technical problems at Freeport-McMoRan's offshore sulfur mine lead to a substantial drop in production and a decrease in sulfur value. These decreases were mitigated somewhat by increases in the values of construction and industrial sand and gravel, salt, and common clay (table 1).

Based upon USGS estimates of the quantities produced in the 50 States during 1999, Louisiana remained the leading State in the Nation in salt and Frasch sulfur production. The State also was a significant producer of common clay and industrial sand and gravel.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN LOUISIANA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	556	9,060	620	11,100	625	10,800
Gemstones	NA	15	NA	5	NA	7
Salt	15,300	169,000	14,900	173,000	14,700	180,000
Sand and gravel:						
Construction	10,400	46,600	11,400	53,800	10,500	50,400
Industrial	644	11,200	623	12,100	623	12,100
Stone: Crushed	1,570 3/	16,100 3/	W	W	W	W
Combined values of gypsum (crude), lime, stone [crushed limestone and miscellaneous (1997), crushed sandstone (1998-99)], sulfur (Frasch), and values indicated by symbol W	XX	151,000 r/	XX	96,300	XX	94,800
Total	XX	403,000 r/	XX	347,000	XX	348,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data.
XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
LOUISIANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	3	W	W	W	--	--	--	--
Sandstone	9	1,570	$16,100	$10.30	1	W	W	W
Miscellaneous stone	1	W	W	W	--	--	--	--
Total or average	XX	1,570	16,100	10.30	XX	W	W	W

W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
LOUISIANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate, graded: Bituminous aggregate, coarse	W	W	W
Fine aggregate (-3/8): Stone sand, concrete	W	W	W
Total or average	W	W	W

W Withheld to avoid disclosing company proprietary data.

TABLE 4
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	2,130	$13,100	$6.13
Asphaltic concrete aggregates and other bituminous mixtures	324	1,290	3.99
Road base and coverings 2/	252	889	3.53
Fill	563	1,540	2.74
Other miscellaneous uses 3/	25	378	15.12
Unspecified: 4/			
Actual	5,970	27,300	4.57
Estimated	2,140	9,400	4.39
Total or average	11,400	53,800	4.72

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Reported and estimated production without a breakdown by end use.

TABLE 5
LOUISIANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	W	W	W	W	686	3,380
Asphaltic concrete aggregates and road base materials 2/	W	W	308	1,060	W	W
Fill	180	565	264	814	119	164
Other miscellaneous uses 3/	--	--	W	W	W	W
Unspecified: 4/						
Actual	25	56	556	1,610	5,390	25,600
Estimated	143	710	343	1,650	1,650	7,030
Total	793	4,420	2,500	11,900	8,100	37,500

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

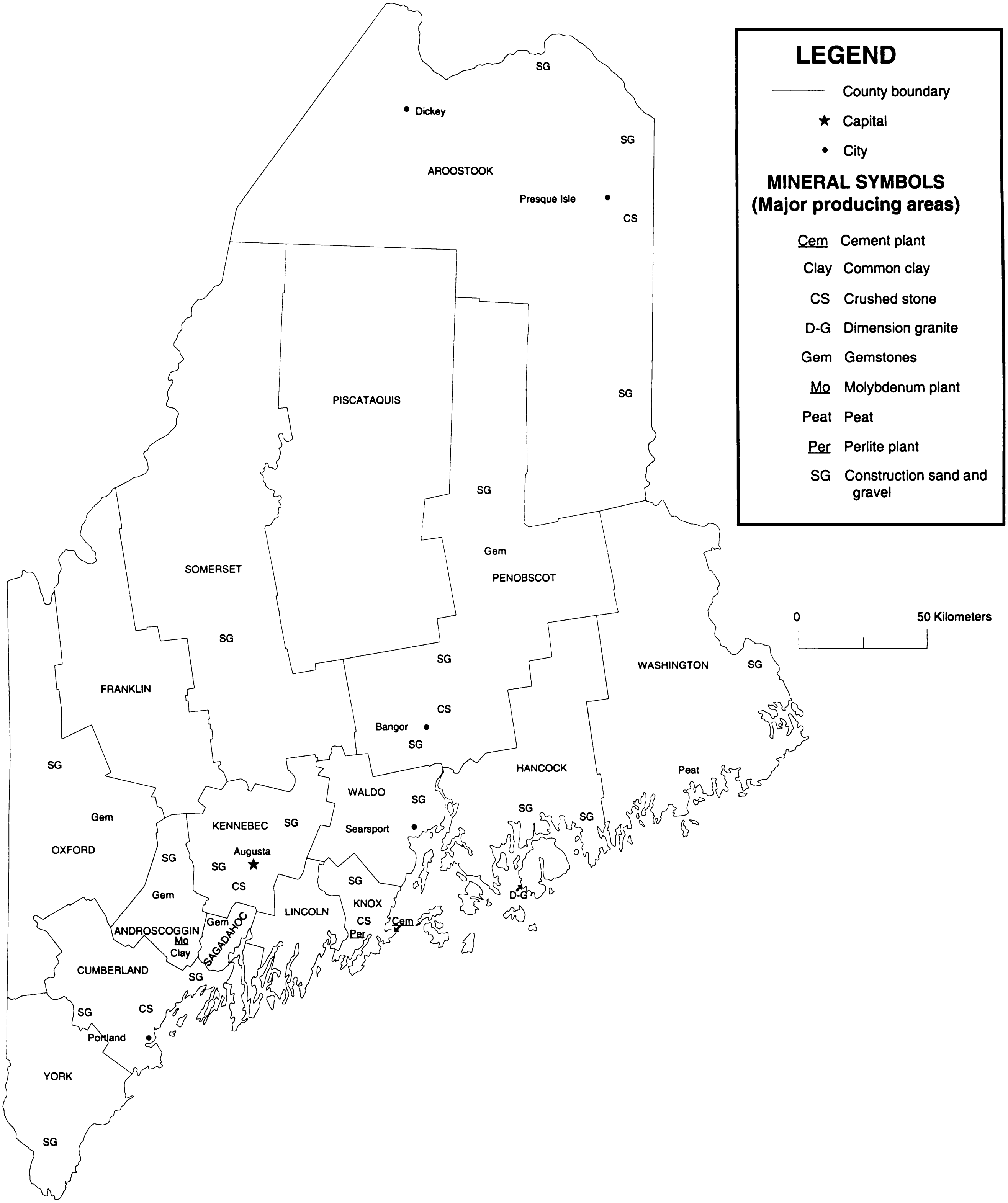
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Reported and estimated production without a breakdown by end use.

MAINE



LEGEND

———	County boundary
★	Capital
●	City

MINERAL SYMBOLS (Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
Gem	Gemstones
Mo	Molybdenum plant
Peat	Peat
Per	Perlite plant
SG	Construction sand and gravel

Source: Maine Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MAINE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maine Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Maine was $101 million, according to the U.S. Geological Survey (USGS). This was a 10% increase from that of 1998,[2] and followed a 30.5% increase in 1998 from that of 1997. Maine's increase in value in 1999 mostly resulted from an increase in the value of construction sand and gravel, further supported by smaller yet significant increases in peat, crushed stone, and portland cement. (Listing of minerals is in descending order of change in value.) In 1998, the State's substantial rise in value was led by increases in portland cement, crushed stone, and construction sand and gravel. Relative to these changes, peat had a small yet significant decrease in value for the year (table 1).

Based upon USGS estimates of the quantities of peat produced in the United States, Maine increased in rank to share fourth place with another State in 1999, up from sixth in 1998. Additionally, the State was a significant producer of gemstones.

The Maine Geological Survey provided the following narrative information.[3] Increases in aggregate and cement production were related to general construction increases; no major highway construction projects began in the State in 1999.

In the metals sector, Freewest Resources Canada, Inc., continued its grass roots gold exploration program along the United States-Canada border at its "Golden Ridge Property" (Freewest Resources Canada, Inc., Thunder Bay, Ontario, August 1998, Summary report on the Golden Ridge property of Freewest Resources Canada, Inc., York and Carleton Counties, New Brunswick, town of Amity, ME, NTS 21G/13, accessed August 1, 2000, at URL http://www.freewest.com). The property comprises 9,130 hectares (ha), consisting of 2,590 ha in the State of Maine and 6,540 ha in the Canadian Province of New Brunswick. While exploration work continued in 1999, the most prominent target defined to date is situated in the Poplar Mountain Volcanic Complex (PMVC) on the New Brunswick side of the border. The PMVC is an elliptical-shaped volcanic center, 4.5 kilometers (km) long and 1.5 km wide that consists of pyroclastic rocks, volcanic flows, and high-level intrusions of andesitic to dacitic composition, and is closely associated with a major terrane boundary marked by the crustal-scale, Woodstock Fault. Gold on Poplar Mountain is hosted by a brecciated, aphanitic andesite intrusion. Gold mineralization is of two distinct styles: the first comprising finely disseminated arsenopyrite and pyrite within intensely altered andesite and the second consisting of quartz-albite-cemented hydrothermal breccia developed within the intrusion and on its margins. Such mineralization is associated with a moderate strength induced polarization anomaly and 1.4-km-long gold-in-soil anomaly.

Trenching at the Poplar Mountain prospect has uncovered broad mineralized deformation zones in dacite porphyry containing quartz vein stockwork and quartz breccias within and on the margins of the Woodstock Fault. Channel sampling returned values up to 1.8 grams per metric ton (g/t) gold over a mineralized zone up to 60 meters wide. All of the mineralized zones show remarkable consistency in gold grade with assays ranging from 210 parts per billion to 5,530 parts per billion, reflecting the disseminated nature of mineralization.

For the balance of the grid surveyed to the north of Poplar Mountain in Maine, soil geochemistry results have been plotted. Several strong gold, arsenic, and antimony anomalies have been identified within the PMVC. The largest is 1.2 km long and contains gold-in-soil values of up to 875 parts per billion. Prospecting performed nearby in Maine has also located several large meter-size blocks of debris flow, pyroclastic rocks containing fine-grained massive sulfide clasts. The clasts assay up to 0.192% copper, 6.13% lead, 11.1% zinc, 108 g/t silver, and 1.1 g/t gold. A series of isolated, weak to moderate strength airborne electromagnetic anomalies situated nearby suggest a possible source area for the massive sulfides.

At the close of 1997, NNM Resources, Inc., a wholly owned subsidiary of Black Hawk Mining Inc., submitted a permit application to open a gold and silver mine at the Bald Mountain deposit in T12 R8 of Aroostook County. The application was for surface mining of just the gossan cap, which overlies the 32-million-metric-ton base metal sulfide deposit. The application was reviewed by the Maine Land Use Regulation Commission and the Maine Department of Environmental Protection. Citing low metal prices, Black Hawk withdrew its application in mid-1999, stating its intent to pursue this project further when prices improved.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Robert G. Marvinney, Director and State Geologist of the Maine Geological Survey, authored the text of the State's mineral industry information.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MAINE 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	230	NA	228	NA	229
Sand and gravel: Construction	6,280	28,400	7,640	33,400	8,920	39,800
Stone: Crushed	2,540	15,100	4,120	23,000	4,200	24,100
Combined values of cement, clays (common), peat, stone (dimension granite)	XX	26,500	XX	35,000	XX	36,700
Total	XX	70,200	XX	91,600	XX	101,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
MAINE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5	1,030	$6,400	$6.24	5	1,360	$8,020	$5.90
Granite	3	W	W	5.71	3	478	3,410	7.13
Quartzite	2	W	W	5.66	2	W	W	6.81
Slate	2	W	W	7.28	2	W	W	5.17
Traprock	2	W	W	5.51	2	W	W	3.96
Miscellaneous stone	5	W	W	4.08	6	836	4,420	5.29
Total or average	XX	2,540	15,100	5.93	XX	4,120	23,000	5.58

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
MAINE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	40	$286	$7.15
Filter stone	104	508	4.88
Other coarse aggregate	34	222	6.53
Total or average	178	1,020	5.71
Coarse aggregate, graded:			
Concrete aggregate, coarse	164	951	5.80
Bituminous aggregate, coarse	613	3,880	6.33
Bituminous surface-treatment aggregate	(3/)	(3/)	9.59
Railroad ballast	(3/)	(3/)	6.43
Other graded coarse aggregate	207	2,170	10.49
Total or average	1,150	8,540	7.40
Fine aggregate (-3/8 inch):			
Stone sand, concrete	(3/)	(3/)	3.33
Stone sand, bituminous mix or seal	(3/)	(3/)	4.65
Screening, undesignated	(3/)	(3/)	4.76
Other fine aggregate	84	325	3.87
Total or average	397	1,740	4.39
Coarse and fine aggregates:			
Graded road base or subbase	(3/)	(3/)	4.55
Unpaved road surfacing	(3/)	(3/)	3.00
Crusher run or fill or waste	(3/)	(3/)	3.22
Other coarse and fine aggregates	(3/)	(3/)	4.84
Total or average	222	1,010	4.53
Agricultural limestone	W	W	14.73
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	4.97
Lime manufacture	(3/)	(3/)	3.08
Total or average	600	2,970	4.95
Other miscellaneous uses: Other specified uses not listed	W	W	5.07
Unspecified: 4/			
Actual	591	2,940	4.97
Estimated	819	3,910	4.77
Total or average	1,410	6,850	4.85
Grand total or average	4,120	23,000	5.58

W Withheld to avoid disclosing company proprietary data; included in "Grand total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, quartzite, slate, and traprock.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
MAINE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	660	$3,480	$5.27
Concrete products (blocks, bricks, pipe, decorative, etc.)	93	726	7.81
Asphaltic concrete aggregates and other bituminous mixtures	1,020	6,470	6.34
Road base and coverings 3/	1,500	5,550	3.71
Fill	438	1,260	2.87
Snow and ice control	649	2,190	3.37
Filtration	19	124	6.53
Other miscellaneous uses	301	871	2.89
Unspecified: 4/			
Actual	516	2,320	4.50
Estimated	2,440	10,400	4.26
Total or average	7,640	33,400	4.37

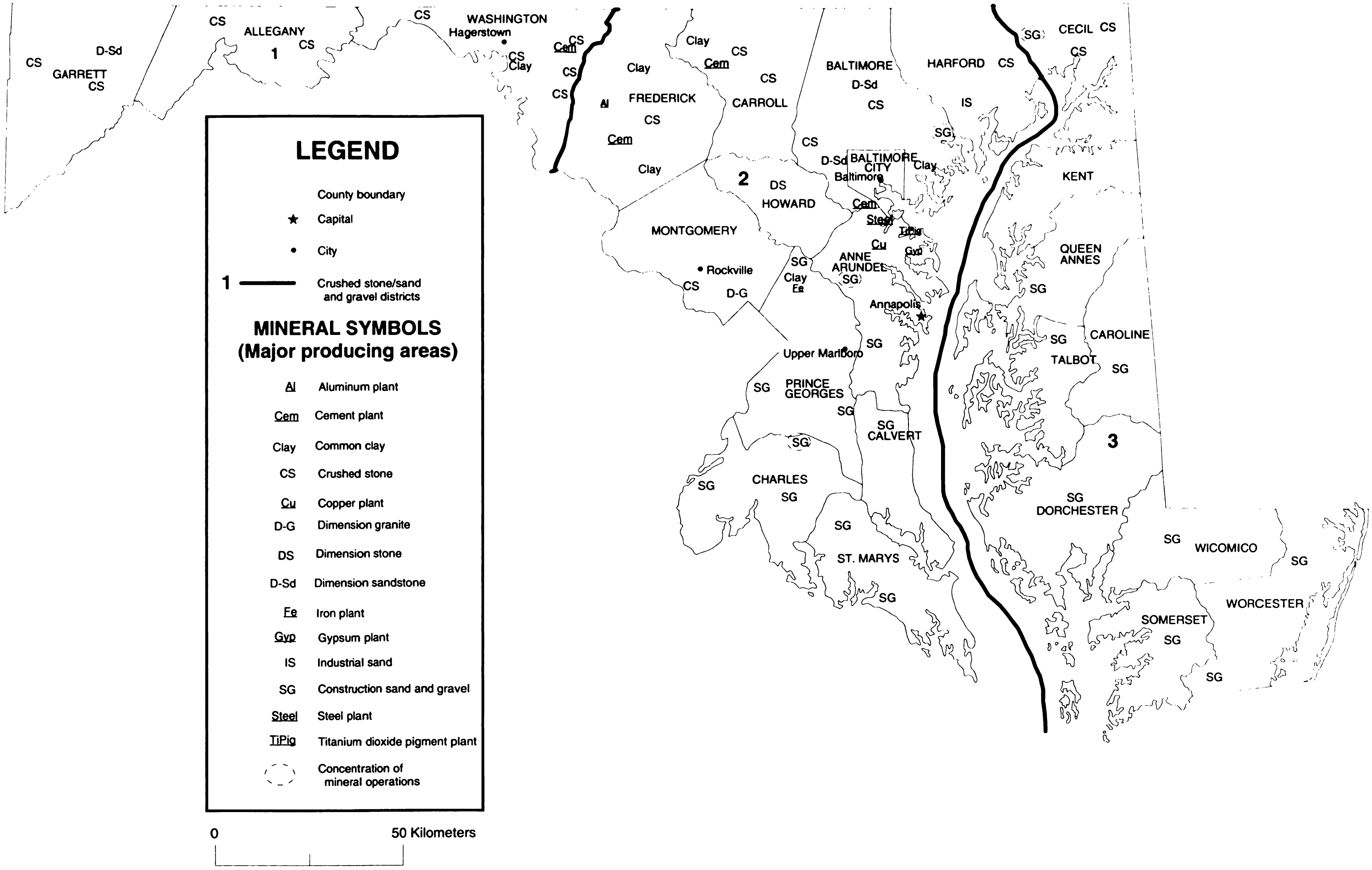
1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes road and other stabilization (lime).

4/ Reported and estimated production without a breakdown by end use.

MARYLAND



Source: Maryland Department of the Environment/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MARYLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Maryland Department of the Environment, Minerals, Oil, and Gas Division for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Maryland was $336 million, according to the U.S. Geological Survey (USGS). This was about a 5% decrease from that of 1998,[2] following a 5.1% decrease in value in 1998 from 1997. The State ranked 34th among the 50 States in 1999 in total nonfuel mineral production value, of which Maryland accounted for about 1% of the U.S. total.

In 1999, crushed stone, by value, was Maryland's leading nonfuel mineral. (This includes crushed stone that is listed in the "Combined values" section of table 1). It was followed by portland cement and construction sand and gravel. Decreases in the values of crushed stone and construction sand and gravel accounted for most of the State's drop in value in 1999. Only portland and masonry cements and dimension stone showed increases for the year, while industrial sand and gravel and gemstones remained the same. In 1998, a $19 million decrease in crushed stone value and a nearly $5 million drop in construction sand and gravel value were responsible for most of the State's decrease in value from 1997. Only cement, especially portland cement with an $8 million increase, had a significant rise in value for the year.

All nonfuel minerals mined in Maryland were industrial minerals. While Maryland remained 10th in the production of masonry cement, the State continued to produce substantial quantities of crushed stone, portland cement, and dimension stone. All metal production, in particular primary aluminum and raw steel, was processed from materials received from foreign and other domestic sources.

The Maryland Department of the Environment (MDE) provided the following narrative information.[3] The MDE issued a permit for a new limestone quarry in Carroll County. The 51.4-hectare permit issued to The Arundel Corp. had been under review for several years. Several agency permits were required for the site, including a Water Appropriation Permit and a Non-Tidal Wetlands and Waterways Permit for relocation of an on-site stream. The company will maintain a historic house on the property.

Mike Davidson Sand and Gravel, LLC commenced an innovative education program at its Salisbury pit in Caroline County. A large shed was built to house fish tanks, a classroom, and a work area. Students from local high schools will participate in a program to raise fish in the tanks and outside in a small pond and in pens in the large lake that was created by the mining operation. The growth and mortality rates of the fish will be compared. The students will be responsible for all aspects of the operation from feeding and caring for the fish to harvesting and marketing them.

The MDE worked with Chaney Enterprises Limited Partnership on an innovative reclamation plan at the Mardis pit in Anne Arundel County. The site will be reclaimed as an 18-hole golf course. The golf course will enhance and maintain on-site nontidal wetlands and preserve most of the mature trees. Each hole will replicate a famous hole at an existing golf course. Mining and wash-plant activities had been ongoing at the site for about 50 years.

The MDE participated in a pilot study program to assess the impacts from sand and gravel mining on agricultural land. The study program resulted from legislation supported by farmers who want to put their land into a funded agricultural trust program and who also want to be able to have sand and gravel mined on their property. Current restrictions in the Agricultural Preservation Program prohibit mining on trust lands. The work group will consist of representatives from the mining industry, agricultural community, regulatory agencies, and soil scientists.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at http://minerals.usgs.gov/minerals/contacts/comdir.html; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change, while related rankings may also be subject to change.

[3] C. Edmond Larrimore, Chief, Minerals, Oil and Gas Division, authored the narrative information that was submitted by the Maryland Department of the Environment

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MARYLAND 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	1,790	115,000 e/	1,760	123,000 e/	1,800	126,000 e/
Clays: Common	287	1,010	339	1,380	342	1,350
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	10,100	65,400	10,400	60,500	9,350	55,600
Stone:						
Crushed 3/	24,700 r/	161,000 r/	24,300	141,000	21,300	126,000
Dimension metric tons	21,500	2,440	23,100	2,730	24,400	3,000
Combined values of cement (masonry), sand and gravel (industrial), stone [crushed marble and traprock (1997-98); crushed marble, shell, traprock (1999)]	XX	26,800 r/	XX	23,700	XX	24,100
Total	XX	371,000	XX	352,000	XX	336,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MARYLAND: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	19	18,300	$122,000	$6.67	21	18,300	$102,000	$5.55
Granite	3	6,020	36,100	6.00	3	5,880	38,100	6.49
Marble	1	W	W	W	1	W	W	W
Sandstone	3	172	1,580	9.14	3	137	798	5.79
Shell	1	(2)	(2)	(2)	1	W	W	W
Traprock	1	W	W	W	1	W	W	W
Total or average	XX	24,700 r/	161,000 r/	6.52	XX	24,300	141,000	5.78

r/ Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 3
MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	$9.03
Filter stone	W	W	6.22
Other coarse aggregate	W	W	2.76
Total or average	1,110	$5,330	4.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,510	11,700	7.75
Bituminous aggregate, coarse	401	2,980	7.44
Bituminous surface-treatment aggregate	W	W	7.67
Railroad ballast	W	W	11.23
Total or average	2,130	16,400	7.70
Fine aggregate (-3/8 inch):			
Stone sand, concrete	78	429	5.50
Stone sand, bituminous mix or seal	W	W	5.85
Screening, undesignated	36	270	7.50
Other fine aggregate	W	W	6.67
Total or average	747	4,540	6.08
Coarse and fine aggregates:			
Graded road base or subbase	1,670	11,100	6.63
Crusher run or fill or waste	W	W	4.07
Other coarse and fine aggregates	W	W	4.41
Total or average	2,570	15,000	5.82
Chemical and metallurgical: Cement manufacture	(3/)	(3/)	3.31
Other miscellaneous uses: Other specified uses not listed	(3/)	(3/)	4.81
Unspecified: 4/			
Actual	14,900	90,000	6.03
Estimated	407	2,480	6.08
Total or average	15,300	92,500	6.03
Grand total or average	24,300	141,000	5.78

W Withheld to avoid disclosing company proprietary data; included in "total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, and sandstone; excludes marble, shell, and traprock to avoid disclosing company proprietary data.

3/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
MARYLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W	W	W
Fine aggregate (-3/8 inch) 5/	W	W	(6/)	(6/)	W	W
Coarse and fine aggregate 7/	903	4,160	554	4,020	1,110	6,880
Other construction materials	305	2,110	2,400	14,500	1,390	10,700
Chemical and metallurgical 8/	(9/)	(9/)	(9/)	(9/)	--	--
Other miscellaneous uses	--	--	(9/)	(9/)	--	--
Unspecified: 10/						
Actual	(9/)	(9/)	(9/)	(9/)	--	--
Estimated	407	2,480	--	--	(6/)	(6/)
Total	3,760	18,900	18,100	104,000	2,500	17,600

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite, limestone and sandstone; excludes marble, shell, and traprock to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Excluded to avoid disclosing company proprietary data.

7/ Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.

8/ Includes cement manufacture.

9/ Withheld to avoid disclosing company proprietary data; included in "Total."

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	4,020	$22,200	$5.51
Concrete products (blocks, bricks, pipe, decorative, etc.)	5	28	5.60
Asphaltic concrete aggregates and other bituminous mixtures	167	439	2.63
Road base and coverings 3/	135	279	2.07
Other miscellaneous uses 4/	426	1,010	2.36
Unspecified: 5/			
Actual	3,160	24,200	7.67
Estimated	2,450	12,400	5.04
Total or average	10,400	60,500	5.83

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road stabilization (lime).

4/ Includes fill, filtration, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

TABLE 6
MARYLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	--	--	W	W	W	W
Asphaltic concrete aggregate and road base materials 3/	--	--	W	W	W	W
Other miscellaneous uses 4/	38	400	289	412	99	193
Unspecified: 5/						
Actual	--	--	3,150	24,200	10	83
Estimated	23	206	1,270	3,750	1,160	8,400
Total	61	606	8,290	46,700	2,020	13,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

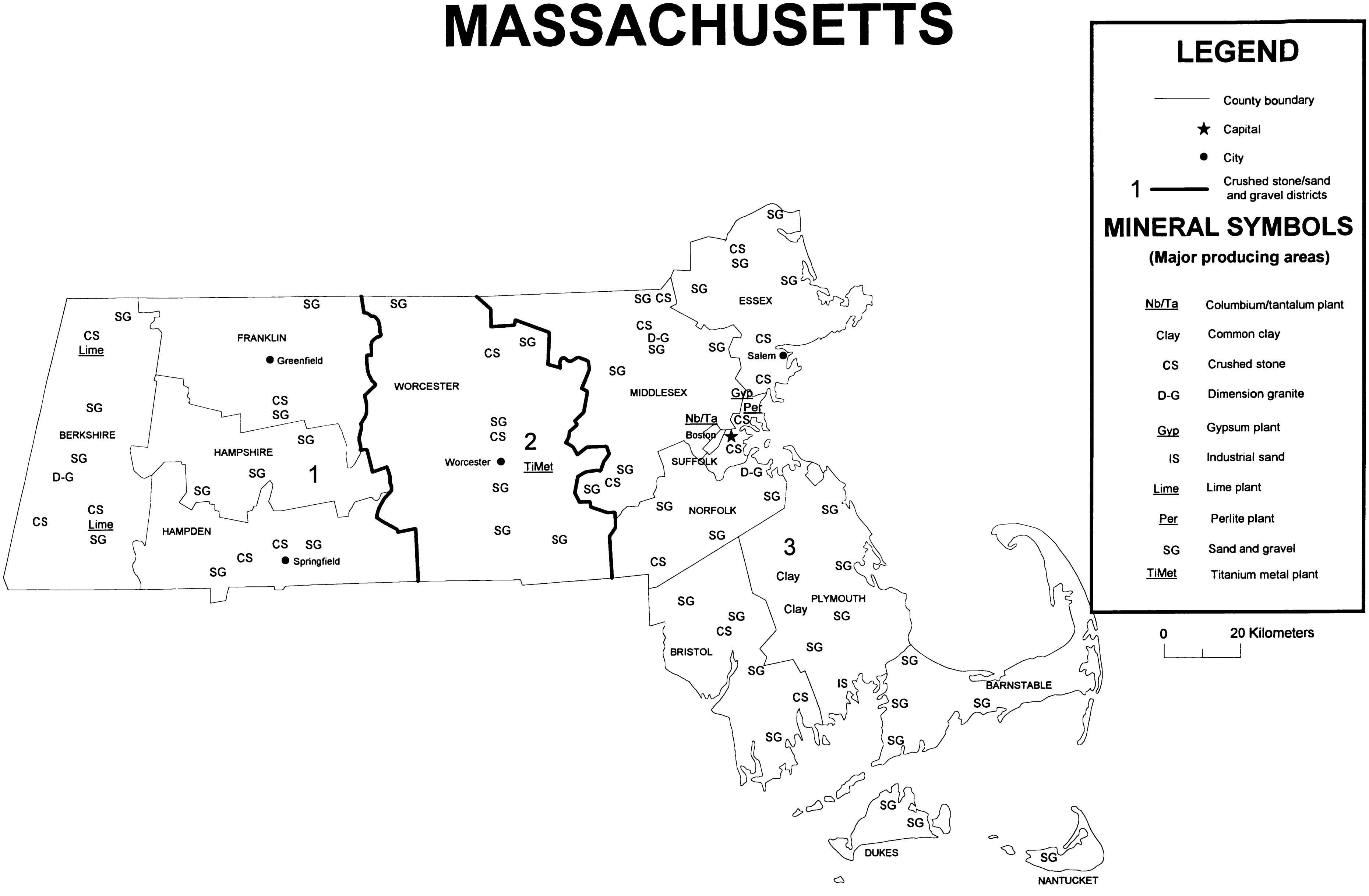
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes fill, filtration, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

MASSACHUSETTS



Source: Massachusetts Executive Office of Environmental Affairs/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MASSACHUSETTS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Massachusetts Executive Office of Environmental Affairs for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Massachusetts was $204 million, according to the U.S. Geological Survey (USGS). No change in value occurred from that of 1998,[2] following a 5.7% increase in 1998 from 1997. The leading mineral commodities by value were crushed stone, construction sand and gravel, and dimension stone. (All mineral commodity listings are by descending order of value or magnitude of change in value.) In 1999, increases in the values of crushed stone and construction sand gravel of more than $5 million and $2 million, respectively, offset nearly an $8 million decrease in the value of dimension stone. In 1998, most nonfuel minerals increased in value, led by a $6.5 million increase in construction sand and gravel and a $5.6 million increase in crushed stone (table 1). Based upon USGS estimates of the quantities of dimension stone produced in the United States in 1999, Massachusetts decreased to fifth from third.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MASSACHUSETTS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Gemstones		NA	1	NA	1	NA	1
Sand and gravel: Construction		13,500	71,500	14,000	78,000	14,100	80,200
Stone:							
Crushed		12,200 3/	91,300 3/	12,800	96,900	13,100	102,000
Dimension	metric tons	101,000	18,100	85,800	17,600	70,400	16,900
Combined values of clays (common), lime, peat (1997), sand and gravel (industrial), stone [crushed miscellaneous (1997)]		XX	11,700	XX	12,000	XX	11,900
Total		XX	193,000	XX	204,000	XX	211,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MASSACHUSETTS: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	7	2,050	$22,200	$10.83	7	2,170	$21,000	$9.67
Granite	9	3,190	20,000	6.27	8	3,140	22,800	7.27
Traprock	17	7,000	49,100	7.02	18	7,230	51,400	7.12
Miscellaneous stone	1	W	W	W	3	228	1,610	7.06
Total or average	XX	12,200	91,300	7.46	XX	12,800	96,900	7.59

W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes limestone-dolomite, reported with no distinction between the two.

TABLE 3
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$8.43
Riprap and jetty stone	41	$350	8.54
Filter stone	11	118	10.73
Other coarse aggregates	85	878	10.33
Coarse aggregate, graded:			
Concrete aggregate, coarse	736	5,950	8.09
Bituminous aggregate, coarse	1,700	10,700	6.32
Bituminous surface-treatment aggregate	84	977	11.63
Railroad ballast	414	2,840	6.87
Other graded coarse aggregate	9	80	8.89
Fine aggregate (-3/8 inch):			
Stone sand, concrete	92	605	6.58
Stone sand, bituminous mix or seal	W	W	4.59
Other fine aggregate	445	1,890	4.26
Coarse and fine aggregates:			
Graded road base or subbase	309	2,720	8.81
Unpaved road surfacing	353	1,900	5.39
Crusher run or fill or waste	443	3,170	7.16
Other coarse and fine aggregates	W	W	3.15
Other construction materials	31	148	4.77
Agricultural:			
Agricultural limestone	W	W	13.85
Poultry grit and mineral food	W	W	13.85
Chemical and metallurgical: Lime manufacture	W	W	W
Special: Other fillers or extenders	W	W	W
Other miscellaneous uses:			
Building products	W	W	16.44
Other specified uses not listed	102	1,590	15.54
Unspecified: 3/			
Actual	4,590	35,700	7.78
Estimated	2,830	19,900	7.02
Total or average	12,800	96,900	7.59

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
MASSACHUSETTS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	W	W	67	683	W	W
Coarse aggregate, graded 3/	W	W	1,290	7,680	W	W
Fine aggregate (-3/8 inch) 4/	W	W	273	1,230	W	W
Coarse and fine aggregate 5/	W	W	412	2,740	W	W
Other construction materials	1,710	11,700	29	142	1,060	951
Agricultural 6/	(7/)	(7/)	--	--	--	--
Chemical and metallurgical 8/	(7/)	(7/)	--	--	--	--
Special 9/	(7/)	(7/)	--	--	--	--
Other miscellaneous uses	--	--	21	253	--	--
Unspecified: 10/						
Actual	--	--	478	3,970	4,100	31,700
Estimated	1,620	11,600	318	2,280	896	6,000
Total	3,820	30,700	2,890	19,000	6,070	47,200

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone and poultry grit and mineral food.

7/ Withheld to avoid disclosing company proprietary data; included in "Total."

8/ Includes lime manufacture.

9/ Includes other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,720	$17,900	$6.59
Plaster and gunite sands	54	573	10.61
Concrete products (blocks, bricks, pipe, decorative, etc.)	70	412	5.89
Asphaltic concrete aggregates and other bituminous mixtures	357	3,230	9.06
Road base and coverings 2/	1,070	5,260	4.93
Fill	2,060	5,970	2.89
Snow and ice control	347	1,630	4.71
Filtration	18	52	2.89
Unspecified: 3/			
Actual	1,450	3,930	2.71
Estimated	5,880	39,000	6.63
Total or average	14,000	78,000	5.56

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
MASSACHUSETTS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	W	W	1,810	13,200
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	--	--
Road base and coverings 3/	162	689	400	1,850	505	2,720
Fill	311	513	711	1,840	1,040	3,620
Snow and ice control	29	142	236	982	83	510
Filtration	--	--	18	52	--	--
Unspecified 4/	1,260	5,810	1,730	6,050	4,340	31,100
Total	2,490	12,300	3,760	14,500	7,780	51,100

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

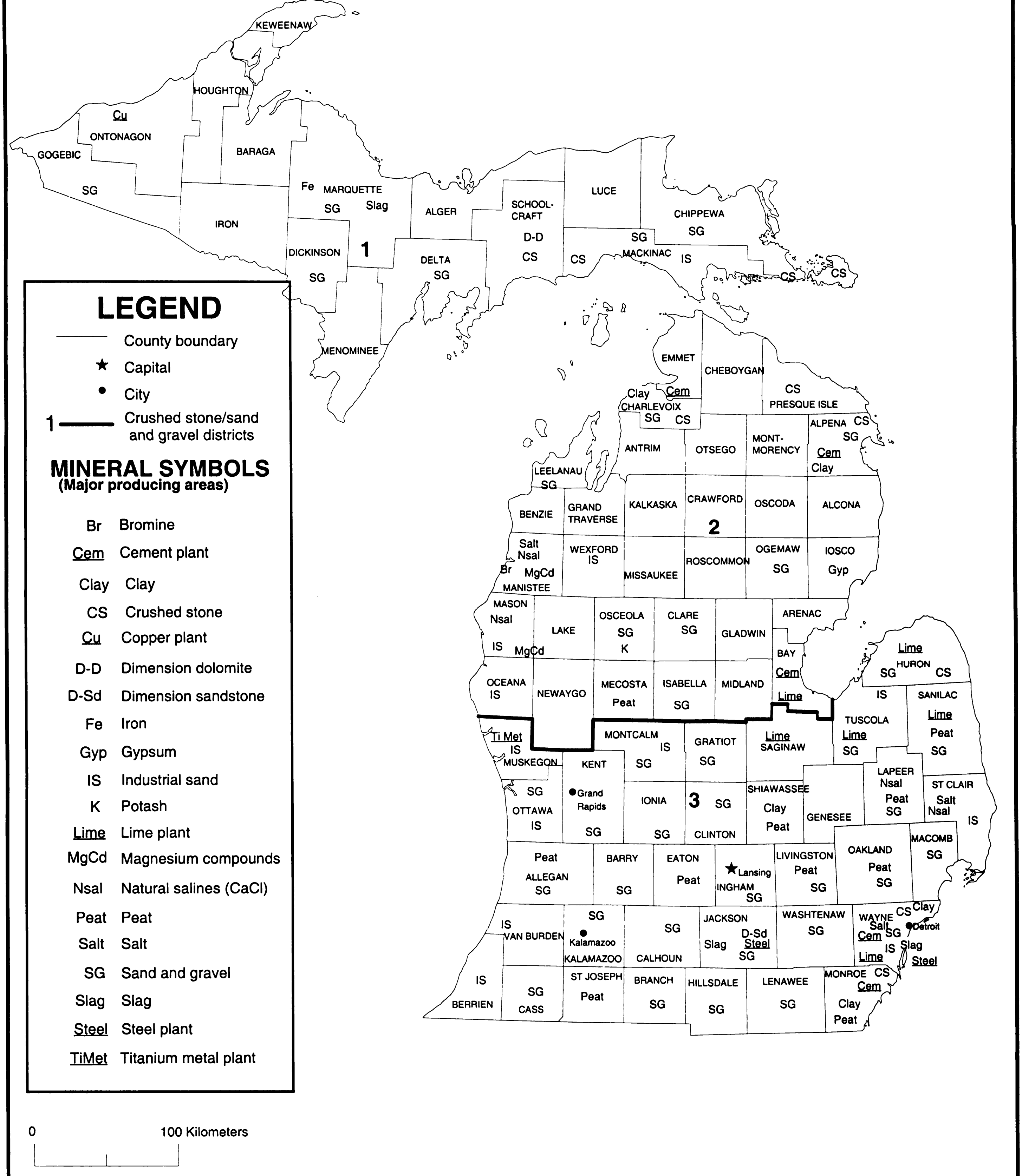
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (lime).

4/ Reported and estimated production without a breakdown by end use.

MICHIGAN



Source: Michigan Department of Environmental Quality, Geological Survey Division/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MICHIGAN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Michigan Department of Environmental Quality, Geological Survey Division, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Michigan was $1.66 billion, according to the U.S. Geological Survey (USGS). This value equals that of 1997, but was a marginal decrease from that of 1998.[2] The State rose to seventh from eighth in rank among the 50 States in total nonfuel mineral production value, of which Michigan accounted for more than 4% of the U.S. total.

Michigan continued to be the Nation's second leading iron ore-producing State in 1999, and iron ore was by value the State's leading nonfuel mineral. Portland cement continued to be second, followed by construction sand and gravel, crushed stone, and magnesium compounds. In 1999, a more than $30 million drop in the value of iron ore plus smaller yet significant drops in magnesium compounds, construction sand and gravel, and crushed stone totaled slightly more than increases in cement (up $11 million), salt (up about $8 million), potash (up about $5 million), and bromine values, resulting in a decrease for the year. (Listings are in descending order of change.) In 1998, increases of more than $40 million in iron ore, $22 million in construction sand and gravel, a combined $17 million increase in portland and masonry cements, and a more than $7 million rise in potash led the State's increase. Overall, the increase was significantly mitigated by drops in the values of magnesium compounds, down more than $50 million, salt and bromine, down a combined $23 million, plus smaller decreases in industrial sand and gravel, gypsum, and lime. All other changes for both years were small and did not affect the net results.

Compared with USGS estimates of the quantities produced in the other 49 States in 1999, Michigan remained first[2] in magnesium compounds; second in iron ore, industrial sand and gravel, peat, and iron oxide pigments; and second of two bromine-producing States; third in construction sand and gravel and third of three States that produce potash; fourth in portland cement and crude gypsum; and seventh in masonry cement. The State rose to 8th from 10th in salt and was a significant producer of crushed stone, lime, and common clays. Michigan remained fifth in the Nation in the manufacture of raw steel with an estimated output of nearly 6 million metric tons (Mt), as reported by the American Iron and Steel Institute.

The following narrative information was provided by Michigan's Department of Environmental Quality, Geological Survey Division, and the State's Department of Natural Resources (DNR), Land and Mineral Services Division[3]. The Cleveland-Cliffs Iron Co. managed Michigan's two iron ore producers, the Tilden Mine and the Empire Mine, both in Marquette County in the Upper Peninsula. The Tilden Mine, near Ishpeming, MI, was owned by the Tilden Mining Co., which had 915 employees in 1999. Tilden is one of a very few iron ore mine operations that process both hematite and magnetite iron ores. The mine had an $11 million program in progress to refurbish its operation in 1999, its 25th year. The company and the United Steelworkers of America agreed to a new contract in 1999, however, reduced iron industry sales resulted in a 10-week shutdown, ending in mid-October. Final 1999 production equaled 6.3 Mt (Skillings Mining Review, 2000, p. 26-27).

The Empire Mine, at Palmer, MI, owned by the Empire Iron Mining Partnership, had 1,741 employees in 1999, according to the U.S. Mine Safety and Health Administration. Most of Empire's planned iron ore pellet production was the fluxed variety. In midyear, a 6-week shutdown due to reduced industry sales was announced. Production resumed in mid-October and for the year totaled 7.2 Mt (Skillings Mining Review, 2000, p. 23-24).

Rouge Industries, Inc., a holding company for Rouge Steel Co., Dearborn, MI, had an explosion and fire on February 1, 1999, at the Rouge Complex powerhouse, jointly owned by Rouge Steel Co. and Ford Motor Co. One Ford worker was killed, several were injured in the fire, and three were unaccounted for. The explosion and fire resulted in the loss of electricity, steam, and other utilities to nearly all of the facilities at the Rouge Steel Co. Production partially resumed on February 4, using purchased slabs and coils to replace production lost. (This reduced the use of Cleveland-Cliffs Iron Co. iron ore pellets.) Rouge Industries' board of directors met in early March and predicted a return to full production by late April, and planned maintenance was moved forward. On August 19, five outside contractor employees were overcome by fumes during preparation for scheduled downtime maintenance at the "B" blast furnace facility. One employee died, three were hospitalized, and one was treated and released.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] The text of mineral industry information was authored by Milton A. Gere, Jr., Geologist, Minerals Lease Management Section, Land and Mineral Services Division, Department of Natural Resources and Paul Sundeen, Resource/Mine Reclamation Specialist, Geological Survey Division, Department of Environmental Quality.

BHP Copper Co. North America announced that it would continue to operate its electrolytic copper refinery at White Pine, MI, while closing its other operations (mines, smelter, refinery, and rod mill) in Arizona and New Mexico. White Pine refines about 75,000 metric tons per year of anode copper to electrolytic copper cathode. The copper anodes are shipped 2,012 kilometers by rail to White Pine from the Hudson Bay Mining and Smelting Co. Ltd.'s smelter at Flin Flon, Manitoba, Canada.

The Caledonia Mine, near Mass City in Ontonagon County, is currently Michigan's only copper producing mine. Red Metal Minerals Co. operates this mine and produces a very limited quantity of copper, silver, and other mineral specimens for sale to museums and mineral collectors worldwide.

Industrial Minerals

Early in the year, Hanson, PLC, of London, signed an agreement to purchase Jannock Ltd.'s North American Brick Group, consisting of 16 brick plants in the United States and 5 in Canada. Michigan's sole brick producer, Michigan Division of U.S. Brick, at Corunna, was included in the sale.

During 1999, Georgia-Pacific Corp. closed its gypsum mine on Butterworth Road at Grand Rapids, Kent County. This was the last gypsum mine in Kent County and Michigan's last underground gypsum mine. Open pit mining of gypsum continues in Iosco County.

Sargent Sand Co.'s permit to mine industrial sand from sand dunes near Ludington, Mason County, was expected to be renewed in early 1999. A spokesperson for the Geological Survey Division, Michigan Department of Environmental Quality, said that the barrier dune mining operation near Ludington State Park on Lake Michigan was exempt from the 1989 sand dune law preventing barrier dune mining because the company had been in operation there since the 1930's. It was reported that the company was also considering selling the site for other purposes.

Oglebay Norton Co. announced plans to buy Michigan Limestone Operation's Cedarville and Rogers City limestone and dolomite quarries. The Cedarville Quarry, near Cedarville, Mackinac County, ships material out of Port Dolomite. The Rogers City Quarry is near Rogers City, Presque Isle County, and ships out of Port Calcite. Both ports are on northern Lake Huron. Years ago the quarries belonged to the former U.S. Steel Co.

In late summer, Oglebay Norton Co. announced that it sold its Global Stone Detroit Lime Co. to Carfin SA, a member of the Carmeuse Group.

Lake Superior and Ishpeming Railroad Co., Marquette, announced that the last 1998-99 iron ore pellet cargo left its Presque Isle dock, on Lake Superior, on January 9, 1999, and the last incoming coal shipment to the adjacent coal receiving facility arrived January 7, 1999. The 1999-2000 shipping season began when two ships brought coal on March 19, 1999, and one carried away iron ore pellets on March 28, 1999.

Elsewhere, the Presque Isle Corp. began 1999 limestone shipments from Stoneport, MI, on Lake Huron, on March 25, 1999. Osborne Materials Co. ended its 1998 dolomitic limestone shipping from its Drummond Island facility on the St. Mary's River on November 25, 1998, and started its 1999 season on April 4, 1999. Oglebay Norton Co.'s Global Stone Port Inland began shipping limestone and dolomite from Port Inland, on northern Lake Michigan, on April 10.

During 1999, metallic mineral exploration consisted of very limited fieldwork in search of nonferrous and precious metals on Federal, State, and private lands. These exploration efforts were expected to continue in 2000.

Two companies were reported to have drilled 17 exploration holes, totaling some 2,200 meters in four counties in 1999. Drilling was expected to continue periodically during 2000 on both State and private lands.

The mine cap of the abandoned Ludington C Shaft, Chapin Mine, City of Iron Mountain, subsided in July 1999. The building immediately adjacent to the hole is the local mine history association's museum, and many homes and children are located nearby. A Governor's emergency order allowed State funds to be transferred to Dickinson County to repair this unsafe condition. An engineering consulting firm was hired to recommend repairs that are expected to be completed in late 2000.

The National Science Teachers Association held its 1999 regional convention in Detroit in October. The Minerals Education Coalition, a group of employees from many mineral companies, associations, and agencies staffed a booth and gave free mineral resource materials to hundreds of teachers. Rock and mineral kits, video tapes, and printed literature covering many commodities and the need for minerals were distributed as educational and teaching aides for the science teachers to use in their classrooms.

The A.E. Seaman Mineral Museum, Michigan Technological University, Houghton, MI, announced plans to raise money to move the Mineralogical Museum of Michigan to the site of the Quincy Mine at nearby Hancock, MI. It would be housed in a new building that would include parts of two restored historic mine buildings adjacent to the Quincy Mine Hoist Museum.

The Marquette Range Iron Mining Heritage Theme Park Inc. held a lighting ceremony for the Cliffs Shaft Mine's "B" Shaft on March 5, 1999. Also celebrated was progress in converting the idle Cleveland-Cliffs Iron Co.'s mine site into a historic park, an idea spearheaded by the President of the Marquette Range. Later in the year, volunteers began repairing the old mine "dry house" to become an office and display area for initial displays by the Ishpeming Rock and Mineral Club and the Ishpeming Historical Society. Plans for a Wall of Remembrance with the names of workers from the various mines on the Marquette Iron Range were also announced.

Government Programs

Three direct metallic mineral leases were issued in 1999 for State-owned minerals in the western part of the Upper Peninsula. Late in 1999, a company submitted three direct lease applications. Processing of the lease requests will continue in 2000. During 1999, income from the metallic minerals lease activities on State lands was $26,967.

During 1999, total income from nonmetallic mineral lease activities on State lands exceeded $433,799. Four 1999 and earlier lease nominations for nonmetallic mineral leases were processed or issued in 1999.

A late 1997 nomination for a limestone-dolomite lease for production from the Hendricks Quarry in Mackinac County was processed, and a competitive bid lease sale was held in late 1999. The lease document is scheduled for release in early 2000 to the Payne and Dolan Co.

A salt lease was also requested in 1997. Processing and issuing of the direct lease was finalized in early 1999. The Detroit Salt Co. leased the State acreage adjacent to its reactivated salt mine operation in Detroit, Wayne County.

A 1998 sand and gravel lease nomination, from DNR staff, was processed and finalized in 1999. This 7-year lease was for production from the Nine-Mile Pit in Roscommon County, using the new construction sand, gravel, cobble, boulder and clay lease to replace the older annual permit process. A competitive two-part lease sale was held. The winning royalty bid for this unusually desirable pit was $2.82 per metric ton of material removed. There is a $30,000 minimum annual royalty. Production started in April 1999, and through September the removal of 117,092 metric tons of material was reported with $330,421 paid in royalties.

A 1999 nomination for a nonmetallic mineral exploration lease covered about 2,700 hectares in Dickinson and Iron Counties. The nomination included the exploration for and possible development and production of several potentially present nonmetallic minerals and commodities. A field review was to be completed in 2000 with a competitive lease sale anticipated for later in the year.

The report, "Dimension Stone Feasibility Study—Development Potential in Michigan's Upper Peninsula," was completed in mid-1999 by H. James Bourque and Associates, Sault Ste. Marie, MI. The Michigan Economic Development Corp. provided funding. Ninety-six rock outcrop locations listed in an early 1970's report by Michigan Technological University and other sources were field reviewed for quarry stone characteristics. A number of sites were test drilled, and 11 locations were selected as having dimension stone quarry potential. A news release about the study and related talks tying it with potential job development made favorable news in a number of local newspapers. Stone producers interested in these potential production sites can find the report on the web site of the Michigan Department of Environmental Quality, Geological Survey Division (www.deq.state.mi.us/gsd/dsfs).

The "Michigan Abandoned Underground Mine Inventory" was completed in late 1998, and the related "Report on Mines Requiring Attention" was completed in January 1999. The reports were prepared as aids to public safety in areas of old mines. Limited distribution of the reports was made to the DNR, county mine inspectors, or related agencies in the counties containing old mines. Distribution was limited to prevent the reports from becoming guides to potentially dangerous locations for adventurous people who may enter unsafe areas and be hurt or killed.

Eleven abandoned mine sites needing attention, where the State owns the mineral rights, were selected by the DNR for repair. The sites were selected from the "Report on Mines Requiring Attention," which was published in 1999. A contract-engineering firm will provide repair specifications and secure firms to bid on the safety repair work that will be completed in late 2000. Funds were appropriated by the Legislature through the Michigan DNR.

State funds were used in Gogebic County to fence unsafe mine shafts and related areas near the abandoned Palms Mine in 1999. The shafts were included on the list of State properties requiring repair, which was published in late 2000. These unsafe old iron mines recently reverted to State ownership due to the nonpayment of property taxes by the prior owner.

Reference Cited

Skillings Mining Review, 2000, US/Canadian iron ore production in 2000: Skillings Mining Review, v. 89, no. 31, July 29, p. 21-36.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MICHIGAN 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	289	23,800 e/	294	28,000 e/	302	29,000
Portland	5,700	422,000 e/	5,710	435,000 e/	5,850	445,000
Clays: Common	712	3,750	644	4,520	648	4,410
Gemstones	NA	1	NA	1	NA	1
Gypsum, crude	1,920	17,300	1,830	15,000	1,860	15,300
Lime	802	42,600	761	40,300	760	40,000
Peat	176	4,990	190	5,500	193	5,590
Sand and gravel:						
Construction	62,000	223,000	66,900	245,000	65,000	242,000
Industrial	2,680	30,000	2,390	25,700	2,300	25,000
Stone: Crushed 3/	42,000	157,000	43,700	167,000	42,300	166,000
Combined values of bromine, iron ore (usable), iron oxide pigments (crude), magnesium compounds, potash, salt, stone [crushed granite and miscellaneous (1997), crushed marl and miscellaneous (1998-99), dimension dolomite and sandstone]	XX	733,000 r/	XX	706,000	XX	685,000
Total	XX	1,660,000	XX	1,670,000	XX	1,660,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MICHIGAN: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	21	33,400 r/	$123,000 r/	$3.67 r/	23	34,700	$133,000	$3.83
Dolomite	6	8,580 r/	34,300 r/	4.00 r/	6	8,970	33,500	3.74
Granite	-- r/	-- r/	-- r/	-- r/	--	--	--	--
Calcareous marl	1 r/	W	W	W	1	W	W	W
Sandstone	1	7	113	16.14	1	7	113	16.14
Traprock	--	--	--	--	1	15	48	3.20
Miscellaneous stone	1	W	W	W	1	W	W	W
Total or average	XX	42,000	157,000	3.74	XX	43,700	167,000	3.82

r/ Revised. W Withheld to avoid disclosing company proprietary data. XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	48	$737	$15.36
Filter stone	W	W	4.68
Other coarse aggregate	457	2,280	4.99
Coarse aggregate, graded:			
Concrete aggregate, coarse	4,520	18,100	4.00
Bituminous aggregate, coarse	809	3,800	4.70
Bituminous surface-treatment aggregate	477	3,400	7.13
Railroad ballast	29	209	7.21
Other graded coarse aggregate	W	W	4.98
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	1,580	5,850	3.72
Screening, undesignated	338	1,230	3.64
Coarse and fine aggregates:			
Graded road base or subbase	1,200	5,500	4.58
Unpaved road surfacing	W	W	6.75
Crusher run or fill or waste	W	W	2.20
Other coarse and fine aggregates	1,180	5,880	4.98
Agricultural: Agricultural limestone	99	698	7.05
Chemical and metallurgical:			
Cement manufacture	6,300	20,800	3.31
Lime manufacture	W	W	3.31
Flux stone	5,500	21,600	3.94
Special: Other fillers or extenders	231	1,280	5.52
Unspecified: 3/			
Actual	17,400	61,700	3.55
Estimated	759	2,710	3.58
Total or average	43,700	167,000	3.82

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes calcareous marl, dolomite, limestone, miscellaneous stone, sandstone, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
MICHIGAN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	489	2,870
Coarse aggregate, graded 4/	W	W	W	W	2,200	13,100
Fine aggregate (-3/8 inch) 5/	W	W	W	W	(6/)	(6/)
Coarse and fine aggregate 7/	W	W	513	2,370	1,610	8,260
Other construction materials	3,200	10,900	3,410	13,600	--	--
Agricultural 8/	4	33	(6/)	(6/)	93	645
Chemical and metallurgical 9/	(6/)	(6/)	8,840	32,300	1,030	3,390
Special 10/	--	--	231	1,280	--	--
Other miscellaneous uses	--	--	--	--	(6/)	(6/)
Unspecified: 11/						
Actual	(6/)	(6/)	(6/)	(6/)	454	22,300
Estimated	19	62	437	1,570	303	1,090
Total	10,100	34,100	22,200	80,300	11,400	52,300

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, limestone, sandstone and traprock; excludes calcareous marl and miscellaneous stone to avoid disclosing company proprietary data.

3/ Includes macadam and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

5/ Includes stone sand (bituminous mix or seal), stone sand (concrete), and screening (undesignated).

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes graded road base or subbase, unpaved road surfacing, terrazzo and exposed aggregates, and crusher run (select material or fill).

8/ Includes agricultural limestone.

9/ Includes cement manufacture, chemical stone or alkali works, flux stone, and lime manufacture.

10/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, whiting or whiting substitute, and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	7,770	$27,500	$3.55
Plaster and gunite sands	394	1,850	4.69
Concrete products (blocks, bricks, pipe, decorative, etc.)	142	567	3.99
Asphaltic concrete aggregates and other bituminous mixtures	5990	26,300	4.38
Road base and coverings 2/	12,000	34,900	2.91
Fill	4,890	8,590	1.76
Snow and ice control	501	1,700	3.39
Filtration	24	173	7.21
Other miscellaneous uses 3/	295	1,420	4.80
Unspecified: 4/			
Actual	15,400	67,500	4.39
Estimated	19,500	74,200	3.80
Total or average	66,900	245,000	3.66

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
MICHIGAN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	263	1,640	1,290	4,290	6,620	23,500
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	79	306
Asphaltic concrete aggregates and other bituminous mixtures	9	29	1,020	3,030	4,960	23,200
Road base and coverings 3/	741	2,600	2,200	6,360	9,070	26,000
Fill	W	W	W	W	4,030	7,480
Snow and ice control	77	134	123	284	301	1,280
Other miscellaneous uses 4/	--	--	196	1,200	123	392
Unspecified: 5/	2,650	9,220	2,350	8,210	29,900	124,000
Total	4,080	14,100	7,770	24,300	55,000	206,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

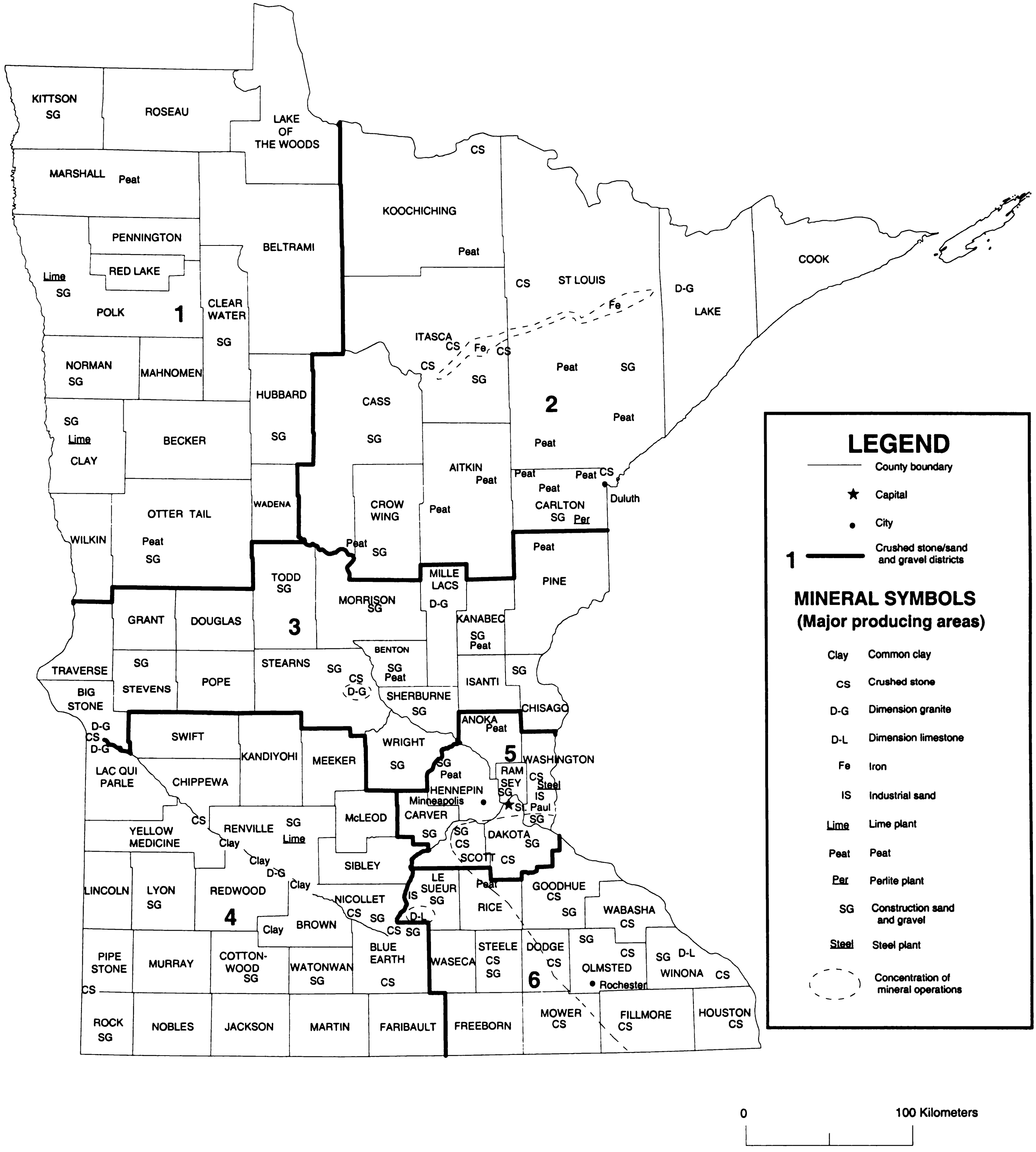
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration and railroad ballast.

5/ Reported and estimated production without a breakdown by end use.

MINNESOTA



Source: Minnesota Department of Natural Resources, Division of Lands and Minerals/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MINNESOTA

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Minnesota was $1.58 billion, according to the U.S. Geological Survey (USGS). This was a 9% decrease from that of 1998,[2] and followed a 3.6% increase from 1997 to 1998. The State remained eighth among the 50 States in total nonfuel mineral production value, of which Minnesota accounted for 4% of the U.S. total.

In 1999, iron ore accounted for more than 82% of the State's nonfuel mineral production value, while construction sand and gravel and crushed stone accounted for 11% and 4%, respectively. In 1999, nearly all of the State's drop in value resulted from the $170 million decrease in the value of iron ore; crushed stone decreased by $4 million. The only significant increase was a $16 million rise in the value of construction sand and gravel. In 1998, Minnesota's increase in value resulted mostly from the increased values of iron ore, up $40 million, and construction sand and gravel, up $27 million; the only significant decreases were relatively small drops in the values of crushed stone and industrial sand and gravel (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States in 1999, Minnesota remained first in the Nation in iron ore and fifth in peat. The State rose to sixth from ninth in construction sand and gravel, but decreased to seventh from sixth in dimension stone. Additionally, the State produced significant quantities of industrial sand and gravel.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MINNESOTA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	5	NA	5	NA	6
Iron ore, usable	47,900	1,430,000	47,200	1,470,000	42,000	1,300,000
Peat	29	1,500	30	1,630	34	1,040
Sand and gravel: Construction	34,500	127,000	39,400	154,000	42,600	170,000
Stone:						
Crushed	14,600	75,000	13,600 3/	71,500 3/	12,500 3/	67,500 3/
Dimension metric tons	33,200	17,900	48,100	18,800	45,200	19,200
Combined values of clays (common), lime, sand and gravel (industrial), stone [crushed sandstone (1998-99)]	XX	23,900	XX	23,000	XX	22,900
Total	XX	1,680,000	XX	1,740,000	XX	1,580,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stone; kind and value included with "Combined values" data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
MINNESOTA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	32	7,350	$35,600	$4.85	30	7,180	$37,300	$5.19
Granite	4	W	W	W	4	W	W	5.85
Dolomite	4	3,080	16,900	5.49	4	3,560	17,400	4.88
Sandstone	3	W	W	W	1	(2/)	(2/)	(2/)
Quartzite	2	W	W	W	2	W	W	6.94
Total or average	XX	14,600	75,000	5.15	XX	13,600	71,500	5.26

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Withheld from total to avoid disclosing company proprietary data.

TABLE 3
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	184	$1,480	$8.02
Filter stone	48	285	5.94
Other coarse aggregate	148	1,410	9.55
Coarse aggregate, graded:			
Concrete aggregate, coarse	434	2,880	6.64
Bituminous aggregate, coarse	335	2,020	6.03
Bituminous surface-treatment aggregate	W	W	7.98
Railroad ballast	586	3,950	6.74
Other graded coarse aggregate	2,070	11,500	5.57
Fine aggregate (-3/8 inch):			
Stone sand, concrete	20	86	4.28
Stone sand, bituminous mix or seal	335	1,870	5.59
Screening, undesignated	W	W	3.39
Other fine aggregate	412	2,290	5.55
Coarse and fine aggregates:			
Graded road base or subbase	1,680	8,610	5.12
Unpaved road surfacing	491	1,880	3.83
Terrazzo and exposed aggregate	W	W	11.78
Crusher run or fill or waste	32	231	7.22
Other coarse and fine aggregates	2,010	10,200	5.09
Other construction materials	181	598	3.31
Agricultural:			
Agricultural limestone	275	1,230	4.47
Poultry grit and mineral food	(3/)	(3/)	16.45
Chemical and metallurgical: Lime manufacture	4	24	6.00
Unspecified: 4/			
Actual	2,660	13,500	5.07
Estimated	1,680	7,230	4.32
Total or average	13,600	71,500	5.26

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, sandstone, and quartzite; excludes sandstone to avoid disclosing company proprietary data.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
MINNESOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/ 3/

(Thousand metric tons and thousand dollars)

	District 3		District 4		District 5		District 6	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 4/	W	W	94	736	222	2,040	W	W
Coarse aggregate, graded 5/	W	W	676	4,430	2,010	11,000	W	W
Fine aggregate (-3/8 inch) 6/	W	W	(7/)	(7/)	419	2,350	W	W
Coarse and fine aggregate 8/	W	W	427	2,600	2,970	15,000	W	W
Other construction materials	1,080	6,810	--	--	181	598	720	2,910
Agricultural 9/	(7/)	(7/)	16	165	178	791	(7/)	(7/)
Chemical and metallurgical 10/	--	--	--	--	4	24	--	--
Other miscellaneous uses	(7/)	(7/)	--	--	--	--	--	--
Unspecified: 11/								
Actual	--	--	(7/)	(7/)	--	--	(7/)	(7/)
Estimated	339	1,120	693	3,250	46	217	597	2,650
Total	1,430	7,960	2,610	15,000	6,030	32,000	3,520	16,400

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, granite, limestone, and quartzite; excludes sandstone to avoid disclosing company proprietary data.

3/ No production reported in Districts 1 and 2.

4/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

6/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

7/ Withheld to avoid disclosing company proprietary data; included in "Total."

8/ Includes crusher run (select material or fill), graded road base or subbase, other coarse and fine aggregates, terrazzo and exposed aggregate, and unpaved road surfacing.

9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

10/ Includes lime manufacture.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit Value
Concrete aggregate	9,710	$48,600	$5.01
Plaster and gunite sands	122	930	7.62
Concrete products (blocks, bricks, pipe, decorative, etc.)	508	3,330	6.56
Asphaltic concrete aggregates and other bituminous mixtures	5,670	25,100	4.42
Road base and coverings	10,100	29,100	2.87
Road stabilization (cement)	94	794	8.45
Road stabilization (lime)	61	104	1.70
Fill	2,980	6,300	2.11
Snow and ice control	180	592	3.29
Railroad ballast	299	1,050	3.52
Filtration	131	674	5.15
Other miscellaneous uses 2/	390	1,300	3.34
Unspecified: 3/			
Actual	2,670	13,900	5.19
Estimated	6,480	22,300	3.45
Total or average	39,400	154,000	3.91

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes roofing granules.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
MINNESOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	1,180	6,590	401	1,290	3,220	14,400
Concrete products (blocks, bricks, pipe, decorative, etc.) 2/	11	57	80	574	321	1,310
Asphaltic concrete aggregates and other bituminous mixtures	296	1,150	W	W	3,510	14,400
Road base and coverings 3/	1,320	4,950	2,210	4,990	4,340	12,000
Fill	506	1,650	493	1,070	260	701
Snow and ice control	--	--	23	47	74	213
Other miscellaneous uses 4/	177	360	814	2,320	207	1,150
Unspecified 5/	1,950	6,640	825	2,970	926	5,960
Total	5,440	21,400	4,850	13,300	12,800	50,100
	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	555	2,690	4,030	21,900	329	1,770
Concrete products (blocks, bricks, pipe, decorative, etc.) 2/	18	120	W	W	W	W
Asphaltic concrete aggregates and other bituminous mixtures	750	5,290	575	2,910	W	W
Road base and coverings 3/	1,010	2,800	1,140	4,390	252	812
Fill	89	120	1,550	2,630	87	133
Snow and ice control	W	W	W	W	W	W
Other miscellaneous uses 4/	56	244	219	2,360	166	447
Unspecified 5/	1,850	7,300	1,570	5,260	2,030	8,070
Total	4,320	18,600	9,070	39,500	2,860	11,200

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

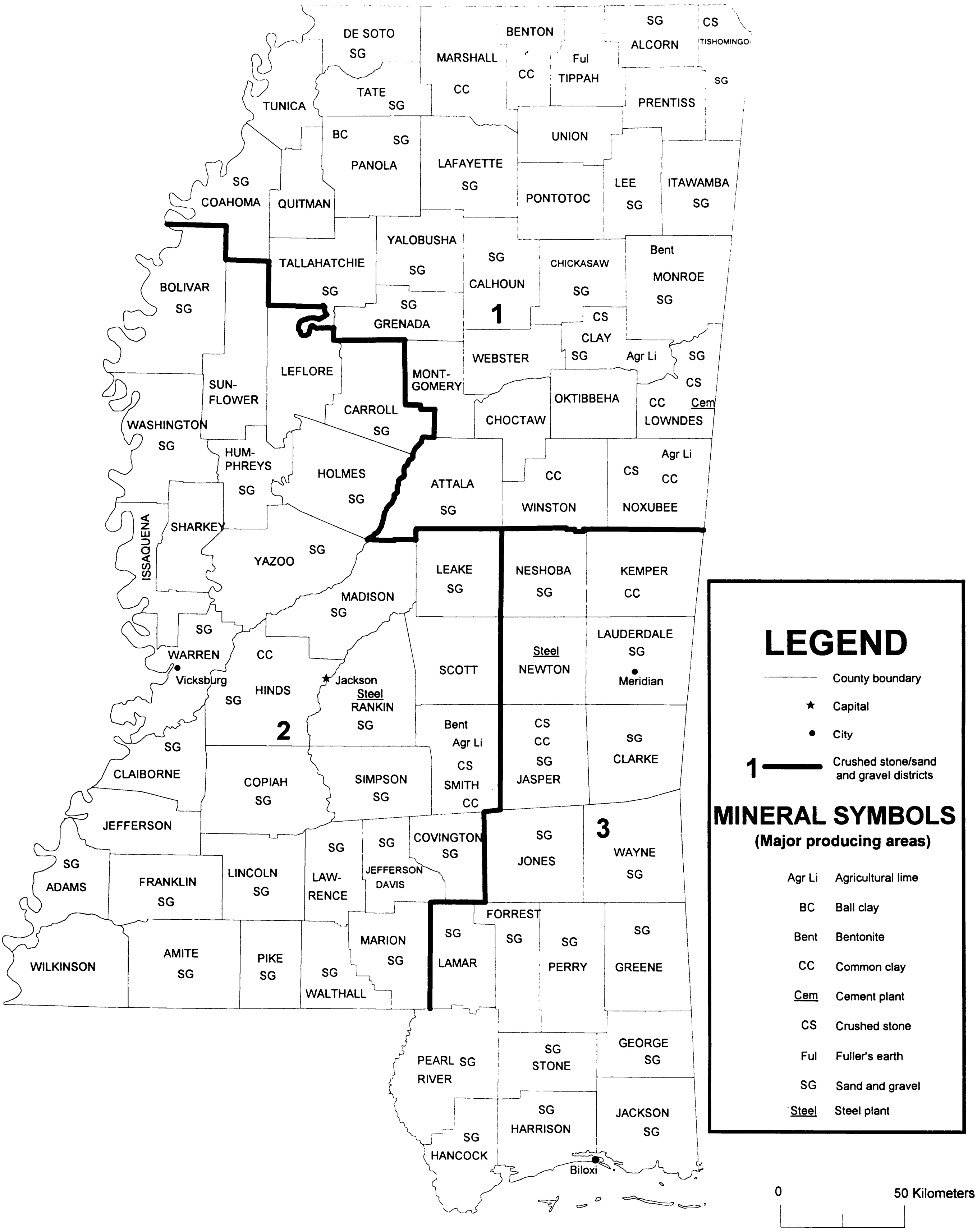
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

MISSISSIPPI



Source: Mississippi Department of Environmental Quality, Office of Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MISSISSIPPI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Mississippi Department of Environmental Quality, Office of Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Mississippi was $168 million, according to the U.S. Geological Survey (USGS). This was about a 6% increase from that of 1998,[2] following a 9.1% decrease in 1998 from 1997.

Construction sand and gravel was Mississippi's leading nonfuel mineral, accounting for about 41% of the State's value in 1999. It was followed by portland cement, fuller's earth, and industrial sand and gravel. Most of the State's rise in value in 1999 resulted from a $5 million increase in construction sand and gravel, further supported by smaller yet significant increases in crushed stone, portland cement, and ball clay (listings are in descending order of increase). Small decreases occurred in bentonite and common clay, while gemstones was unchanged (table 1). In 1998, a $30.1 million decrease in the value of crushed stone was countered somewhat by increases in portland cement and construction sand and gravel.

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 1999, Mississippi remained second in fuller's earth and fourth in ball clay and bentonite. Additionally, the State was a significant producer of construction sand and gravel and common clays. Metals produced in Mississippi, especially raw steel, were processed from materials received from other domestic and foreign sources.

The following narrative information was provided by the Mississippi Department of Environmental Quality's (DEQ) Office of Geology[3] (MOG). Calendar year 1999 was the end of an era for the mining company, Vulcan Materials Co., when its impressive 60-meter-deep (200 feet) aggregate quarry in Tishomingo County was put up for final bond release. The company had been mining in the same Mississippian age limestone quarry since before the Mississippi Surface Mining and Reclamation Act of 1977. Vulcan's established presence in Mississippi can be seen throughout the State in the riprap used in road and bridge building projects and in U.S. Army Corps of Engineers projects.

The Commission on Environmental Quality approved Unimin Corp. for a Class I surface mining permit to expand its clay mine an additional 68 hectares (ha). Unimin holds multiple Class I surface mining permits dating back to 1978 and totaling more than 260 ha. Unimin's large bentonite clay mine is in Monroe County near the town of Aberdeen.

Efforts to amend Mississippi's 1977 Surface Mining and Reclamation Act, the State's noncoal surface mining law, passed in the State Senate but failed in the State House of Representatives. (Similar legislation also failed to pass in the 1997 and the 1998 legislative sessions.) The MOG, the Mississippi Mining Coalition, and the Mississippi Asphalt Paving Association led the efforts to tighten up the 1977 law. According to the MOG, the new bill would have updated the current law for the benefit of the State as well as industry, which assisted in drafting it.

The new law would have reduced the current 60% after-the-fact permit rate by changing a present provision that allows an operator a 10-day grace period to file for a permit, without penalty, after being found by the State to be mining without a valid permit. The current statutes put the onus on government enforcement agencies to "chase after" violators of the law rather than on the operators to abide by mine permitting regulations from the beginning. Also, the current statutes provide for a "temporary permit" to be issued automatically as soon as an application for surface mining is deemed administratively complete. Consequently, the Mississippi Commission on Environmental Quality (CEQ) could issue a permit (in order to guarantee the reclamation of the mine) to an operator who may have already adversely affected an environmentally or culturally sensitive site. Currently, the CEQ both (1) issues the permits for surface mines and (2) enforces laws governing activities at the same mines. According to the MOG, the new law was intended to tighten the permit process, as well as to divide the regulatory authority between the Environmental Quality Permit Board and the CEQ, as it is with all other statutes pertaining to the Mississippi DEQ. Additionally, the legislation would have eliminated the 4-acre (1.6-ha) surface mine permit exemption rule and modified the permit classification system that thoroughly describes how a permit is issued but not how a mine is operated or reclaimed.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000 and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] James E. Starnes, Geologist with the Mississippi Department of Environmental Quality's Office of Geology, provided the Mississippi minerals industry information.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSISSIPPI 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Common	503	3,460	502	3,410	507	3,320
Fuller's earth	388	28,100	372 r/	30,400 r/	371	30,200
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	13,000	59,600	13,300	64,400	14,100	69,400
Stone: Crushed 3/	5,180	32,900	789	2,790	800	5,740
Combined values of cement (portland), clays (ball, bentonite), sand and gravel (industrial), stone (crushed marl)	XX	51,300	XX	58,400 r/	XX	59,100
Total	XX	175,000	XX	159,000 r/	XX	168,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
MISSISSIPPI: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	12	5,180	$32,900	$6.36	3	789	$2,790	$3.54
Calcareous marl	1	W	W	W	2	W	W	W
Total or average	XX	5,180	32,900	6.36	XX	789	2,790	3.54

W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
MISSISSIPPI: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Agricultural: Agricultural limestone	W	W	W
Chemical and metallurgical: Cement manufacture	W	W	W
Unspecified 3/	W	W	W
Total or average	789	2,790	3.54

W Withheld to avoid disclosing company proprietary data, included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone; excludes calcareous marl to avoid disclosing company proprietary data.

3/ Estimated production without a breakdown by end use.

TABLE 4
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	2,390	$12,200	$5.09
Concrete products (blocks, bricks, pipe, decorative, etc.)	94	570	6.06
Asphaltic concrete aggregates and other bituminous mixtures	2,000	10,700	5.33
Road base and coverings	1,110	5,140	4.62
Fill	251	412	1.64
Unspecified: 3/			
Actual	3,510	18,100	5.14
Estimated	3,990	17,400	4.37
Total or average	13,300	64,400	4.83

1/ Data are rounded to no more than three significant digits, may not add to totals shown.

2/ Includes plaster and gunite sand.

3/ Reported and estimated production without a breakdown by end use.

TABLE 5
MISSISSIPPI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts 2/	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 3/	W	W	1,320	5,890	W	W	154	913
Asphaltic concrete aggregates and other bituminous mixtures	872	4,670	1,070	5,810	--	--	61	190
Road base and covering	W	W	570	2,700	W	W	50	185
Fill	60	70	48	152	115	159	28	32
Unspecified: 4/								
Actual	2,490	11,600	714	5,030	313	1,440	--	--
Estimated	777	3,710	2,030	8,130	1,180	5,570	--	--
Total	5,610	27,900	5,750	27,700	1,700	7,510	294	1,320

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.

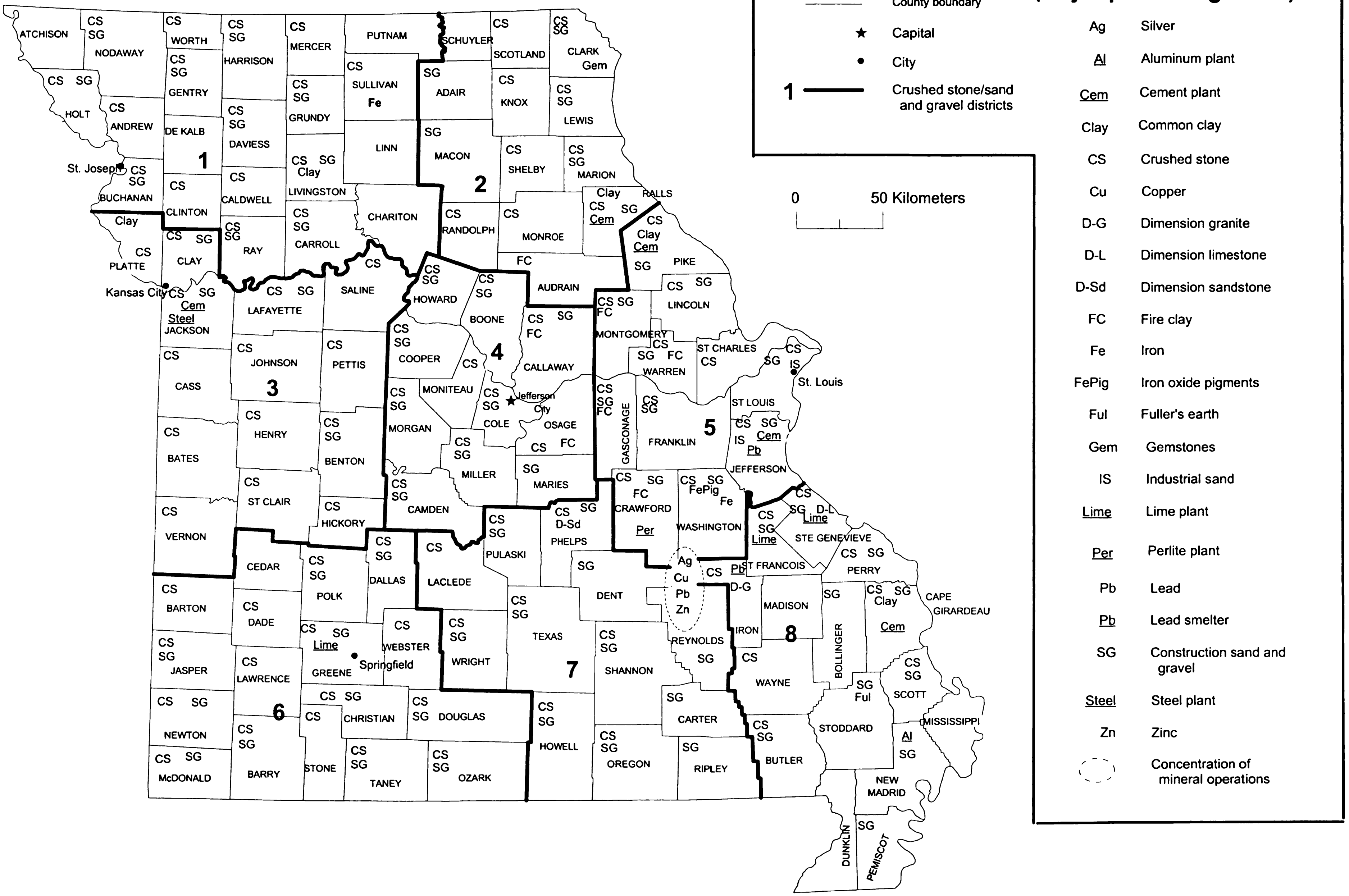
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes production within the State with no district reported.

3/ Includes concrete products and plaster and gunite sand.

4/ Reported and estimated production without a breakdown by end use.

MISSOURI



Source: Missouri Department of Natural Resources, Division of Geology and Land Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MISSOURI

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Missouri Department of Natural Resources, Division of Geology and Land Survey, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Missouri was $1.38 billion, according to the U.S. Geological Survey (USGS). This was a more than 5% increase from that of 1998,[2] following a marginal increase in 1998 from 1997. The State rose in rank to 9th from 10th among the 50 States in total nonfuel mineral production value, of which Missouri accounted for more than 3.5% of the U.S. total.

Missouri continued to be the top lead-producing State in the Nation. The State produced more than 2.5 times and almost 11 times respectively, the amount of lead as that of the two next highest producing States in 1999. However, crushed stone, by value, has been the State's foremost nonfuel mineral commodity since 1997, having traded places with lead, which was first in 1996. Lead had been Missouri's leading nonfuel mineral since 1969, except for several years in the mid-1980's and during 1993-95. Crushed stone surpassed lead and portland cement in 1993, and ranked first through 1995. In 1999, the value of portland cement also surpassed that of lead.

In 1999, crushed stone, portland cement, lead, and lime accounted for 86% of the State's total nonfuel mineral production value. Significantly increased values for crushed stone, construction sand and gravel, and portland cement, together with smaller yet significant increases in lime, industrial sand and gravel, lead, and silver (in descending order), led to the State's overall $70 million increase (table 1). All other changes in value in 1999 were small relative to these. In 1998, the State's increase in value mainly resulted from the increased values of lime, crushed stone, construction sand and gravel, and portland cement. Decreases in copper, zinc, and iron ore somewhat offset the year's gains.

Based upon USGS preliminary estimates of the quantities produced in the 50 States in 1999, Missouri remained first in lime, fire clays and iron oxide pigments; second in fuller's earth; third in iron ore; fifth in portland cement; and seventh in silver and common clays (in descending order of value). The State rose to third from fourth in the production of zinc and to sixth from eighth in crushed stone. Additionally, the State was a significant producer of construction and industrial sand and gravel and masonry cement.

The Missouri Department of Natural Resources, Division of Geology and Land Survey[3] (DGLS), provided the following narrative information. In 1999, production of crushed stone increased more than 8%, along with a rise in unit value (table 1). The DGLS projected that the industry's current level of activity would continue into 2000. Markets in suburban areas near Kansas City and St. Louis, as well as many rural areas, were particularly active. Although consolidation of the aggregate industry slowed in Missouri as few major acquisitions were reported, many companies reported opportunities to sell to the larger interstate and multinational operators. Delta Companies (Southeast Missouri Stone Co.) purchased Williamsville Stone Co., with operations in Butler and Stoddard Counties of southeast Missouri.

Nonetheless, representatives from industry reported to the DGLS a number of growing difficulties. One problem for many producers was the shortage of skilled and willing workers. Several operators reported that they raised salaries and recruited extensively in rural areas, with limited hiring and retention success. Other producers were concerned about increasingly strict environmental regulations, increasing fuel costs, and declining support for highway construction. Several mineral producers expressed serious concerns regarding land-use planning and zoning practices. Other concerns were that too little was being done to ensure the potential availability of aggregate resources, that county officials needed to become more aware of local needs for crushed stone, and that zoning procedures could be an issue.

Production of construction sand and gravel increased by nearly one-third over that of 1998. According to the DGLS, most operators reported busy, active markets for their products; several larger operators in major markets increased sales to ready-mix concrete markets. Major problems facing sand and gravel operators were specifications of their products and environmental regulations. Several operators reported that natural sand is not being used in large amounts in "superpave" asphalt. Another serious issue facing the industry was State and Federal regulations regarding operations on wetlands and floodplains.

According to the DGLS, most of the State's cement plants ran at maximum capacity, and were unable to meet demand; most producers expected the strong demand to continue through 2000. Lafarge Corp. continued with a significant expansion of its cement plant at Sugar Creek in Jackson County. As part of this modernization effort, a shaft was started to access additional limestone reserves in the Mississippian-age St. Louis Limestone. In January 1999, Holnam, Inc. announced that the company was considering building a 3-million-metric-ton-per-year cement plant along the Mississippi River in Ste. Genevieve County. According to Holnam, the plant would be the largest single-line facility in the country, and a second production line could be added if needed. In excess of 1,200 hectares are controlled by the company. Also during 1999, the German Company, Dyckerhoff AG acquired Lone Star Cement Co., which owns a plant at Cape Girardeau in Cape Girardeau County. Industry representatives expressed concern regarding excess cement capacity being planned for the Mississippi River Valley.

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All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Ardel Rueff, Geologist, authored the text of State mineral industry information submitted by the Division of Geology and Land Survey.

Structural clay and shale markets were stronger in 1999 than in 1998, and the outlook for 2000 was for this to continue. Glen Gery Corp. of Utica, Livingston County, expanded by constructing a new kiln. Also during the year, Glen Gery was acquired by CRH Holdings Inc., and is no longer a publicly traded company. Refractory clay production was slightly higher than in 1998, and 2000 is expected to be similar. In late 1998, Global Industrial Technologies, Inc., parent company of A. Harbison Walker Refractories, Inc., purchased A.P. Green Industries, Inc., and on December 31, 1999, Radex Heraklith Industriebeteilgungs AG, parent company of North American Refractories Co., acquired Global. The DGLS expects that the acquisition could result in plant closings in the Missouri clay industry. The cement industry continued to increase its use of refractory clay containing high amounts of iron, alkali, or sand. Existing stockpiles and known resources of these former "waste" clays were being depleted rapidly and cement industry officials are concerned about maintaining a stable supply of material for the future.

The lime market improved in 1999 over 1998, and the DGLS projected that 2000 would likely be somewhat better than 1999. Some in the industry expressed concern about Title 5 and the U.S. Environmental Protection Agency's regulation of noxious gases. Vessel Mineral Products Co. began producing dolomitic lime for the steel industry again in 1999. The plant stopped burning lime in 1997, and the kiln was down for 14 months. The kiln was modernized and production resumed in 1999, with sales increasing. Chemical Lime Co. made changes to its fuel combustion process at its plant in Ste. Genevieve County.

Cimbar Performance Minerals of Baroid Drilling Fluids, Inc. of Halliburton Co. made some major operational changes in 1999. Effective January 1, 1999, the company stopped mining barite in Missouri, but the mill continued processing barite imported from China. Part of the mill was replaced and major renovation of the remaining plant began. Excess company property was put up for sale.

Mineral representatives consistently discussed three issues with DGLS staff—the availability of the resource (societal surface development with too little regard for the need for the underlying resource), the cost of doing business (increasing labor and fuel costs), and the increase in government regulations (especially environmental).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MISSOURI 1/ 2/

(Thousand metric tons and thousand dollars)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	4,730	321,000 e/	4,570	323,000 e/	4,680	331,000 e/
Clays:						
Common	1,050	4,140	1,030	4,440	1,030	4,330
Fire	297	4,280	288	4,,220	288	4,220
Copper 3/	8	19,300	5	9,090	6	9,750
Sand and gravel: Construction	9,530	35,600	9,470	39,300	12,100	51,200
Stone: Crushed	68,400 r/	349,000 r/	68,400	356,000	74,000	395,000
Combined values of cement (masonry), clay (fuller's earth), gemstones, iron ore (usable), iron oxide pigments (crude), lead, lime, sand and gravel (industrial), silver, stone (dimension granite), zinc	XX	573,000	XX	575,000 r/	XX	583,000
Total	XX	1,310,000	XX	1,310,000 r/	XX	1,380,000

e/ Estimated. p/ Preliminary. r/ Revised. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
MISSOURI: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone 2/	176	64,600 r/	$329,000	$5.10	181	64,400	$335,000	$5.20
Dolomite	23	2,600 r/	13,100 r/	5.01	22	2,770	13,200	4.75
Granite	2	W	W	6.77	2	W	W	6.95
Sandstone	1	W	W	2.32	1	W	W	2.39
Traprock	1	W	W	4.96	2	W	W	5.37
Total or average	XX	68,400 r/	349,000 r/	5.10 r/	XX	68,400	356,000	5.21

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	277	$1,450	$5.22
Riprap and jetty stone	2,440	11,200	4.59
Filter stone	188	884	4.70
Other coarse aggregate	752	3,830	5.10
Coarse aggregate, graded:			
Concrete aggregate, coarse	2,640	15,900	6.02
Bituminous aggregate, coarse	1,960	10,900	5.58
Bituminous surface-treatment aggregate	628	3,220	5.12
Railroad ballast	W	W	4.65
Other graded coarse aggregate	3,790	31,200	8.24
Fine aggregate (-3/8 inch):			
Stone sand, concrete	242	1,490	6.17
Stone sand, bituminous mix or seal	252	1,730	6.85
Screening, undesignated	856	3,020	3.52
Other fine aggregate	21	106	5.05
Coarse and fine aggregates:			
Graded road base or subbase	8,320	35,600	4.28
Unpaved road surfacing	2,190	10,100	4.62
Terrazzo and exposed aggregate	(3/)	(3/)	16.93
Crusher run or fill or waste	317	1,440	4.54
Other coarse and fine aggregates	2,560	13,700	5.37
Other construction materials	82	351	4.28
Agricultural:			
Agricultural limestone	1,010	4,840	4.81
Poultry grit and mineral food	(4/)	(4/)	6.47
Chemical and metallurgical:			
Cement manufacture	7,130	28,800	4.03
Lime manufacture	2,900	29,100	10.06
Flux stone	W	W	5.71
Chemical stone	W	W	5.26
Other chemical and metallurgical uses	195	1,030	5.27
Special:			
Asphalt fillers or extenders	3	15	5.00
Roofing granules	(4/)	(4/)	9.29
Other miscellaneous uses:			
Pipe bedding	(4/)	(4/)	5.13
Other specified uses not listed	1	3	2.68
Unspecified: 5/			
Actual	15,000	72,700	4.85
Estimated	14,000	68,000	4.86
Total or average	68,400	356,000	5.21

W Withheld to avoid disclosing company proprietary data; included with "Other".

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, sandstone, and traprock.

3/ Included in "Other coarse and fine aggregates."

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Reported and estimated production without a breakdown by end use.

TABLE 4
MISSOURI: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	74	397	132	694	W	W	134	556
Coarse aggregate, graded 3/	135	731	W	W	1,580	18,700	755	3,860
Fine aggregate (-3/8 inch) 4/	6	38	27	97	74	254	W	W
Coarse and fine aggregate 5/	1,590	9,540	837	4,240	862	3,880	1,220	5,080
Other construction materials	--	--	--	--	--	--	--	--
Agricultural 6/	79	394	84	294	101	428	41	144
Chemical and metallurgical 7/	--	--	W	W	W	W	--	--
Special 8/	--	--	--	--	--	--	--	--
Other miscellaneous uses 9/	1	3	--	--	--	--	--	--
Unspecified: 10/								
Actual	2,270	10,400	W	W	4,660	23,300	W	W
Estimated	654	3,000	2,120	10,500	1,770	8,760	1,750	8,580
Total	4,800	24,500	4,400	20,500	9,790	60,700	4,110	19,100

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	911	4,730	99	649	(11/)	(11/)	2,260	10,100
Coarse aggregate, graded 3/	2900	18,600	1,620	10,100	(11/)	(11/)	1,450	6,520
Fine aggregate (-3/8 inch) 4/	862	3,390	312	2,160	(11/)	(11/)	W	W
Coarse and fine aggregate 5/	3,630	17,500	1,200	6,410	(11/)	(11/)	4,340	18,000
Other construction materials	W	W	34	177	771	3,380	W	W
Agricultural 6/	131	398	267	1,700	W	W	369	1,990
Chemical and metallurgical 7/	W	W	W	W	--	--	4,610	35,100
Special 8/	--	--	W	W	--	--	3	15
Other miscellaneous uses 9/	--	--	--	--	--	--	--	--
Unspecified: 10/								
Actual	4,700	22,000	1,880	10,200	W	W	953	4,520
Estimated	1,970	9,620	3,130	15,300	871	4,160	1,760	8,140
Total	18,400	87,300	9,260	50,800	1,810	8,290	15,900	84,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone and poultry grit and mineral food.

7/ Includes cement manufacture, chemical stone or alkali works, flux stone, and lime manufacture.

8/ Includes asphalt fillers or extenders, and roofing granules.

9/ Includes pipe bedding.

10/ Reported and estimated production without a breakdown by end use.

11/ Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

TABLE 5
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	4,840	$19,800	$4.09
Plaster and gunite sands	105	487	4.64
Concrete products (blocks, bricks, pipe, decorative, etc.)	205	975	4.76
Asphaltic concrete aggregates and other bituminous mixtures	280	1,230	4.38
Road base and coverings	514	2,490	4.84
Fill	227	1,060	4.65
Snow and ice control	70	307	4.39
Other miscellaneous uses 2/	89	795	8.93
Unspecified: 3/			
Actual	633	2,470	3.90
Estimated	2,500	9,670	3.87
Total or average	9,470	39,300	4.15

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filtration and roofing granules.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
MISSOURI: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 4		District 5		District 6		District 7		District 8	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	51	278	W	W	1,310	6,700	3,250	11,800	W	W	243	1,040	253	1,160
Asphaltic concrete aggregates and road base materials 4/	43	172	W	W	212	782	W	W	W	W	335	1,610	W	W
Other miscellaneous uses 5/	--	--	--	--	--	--	W	W	W	W	--	--	W	W
Unspecified 6/	366	1,410	62	322	823	3,040	1,170	4,860	26	235	172	515	514	1,760
Total	459	1,860	141	621	2,340	10,500	4,660	18,200	79	599	751	3,160	1,030	4,260

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Production reported in District 3 was included with District 4 to avoid disclosing company proprietary data.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

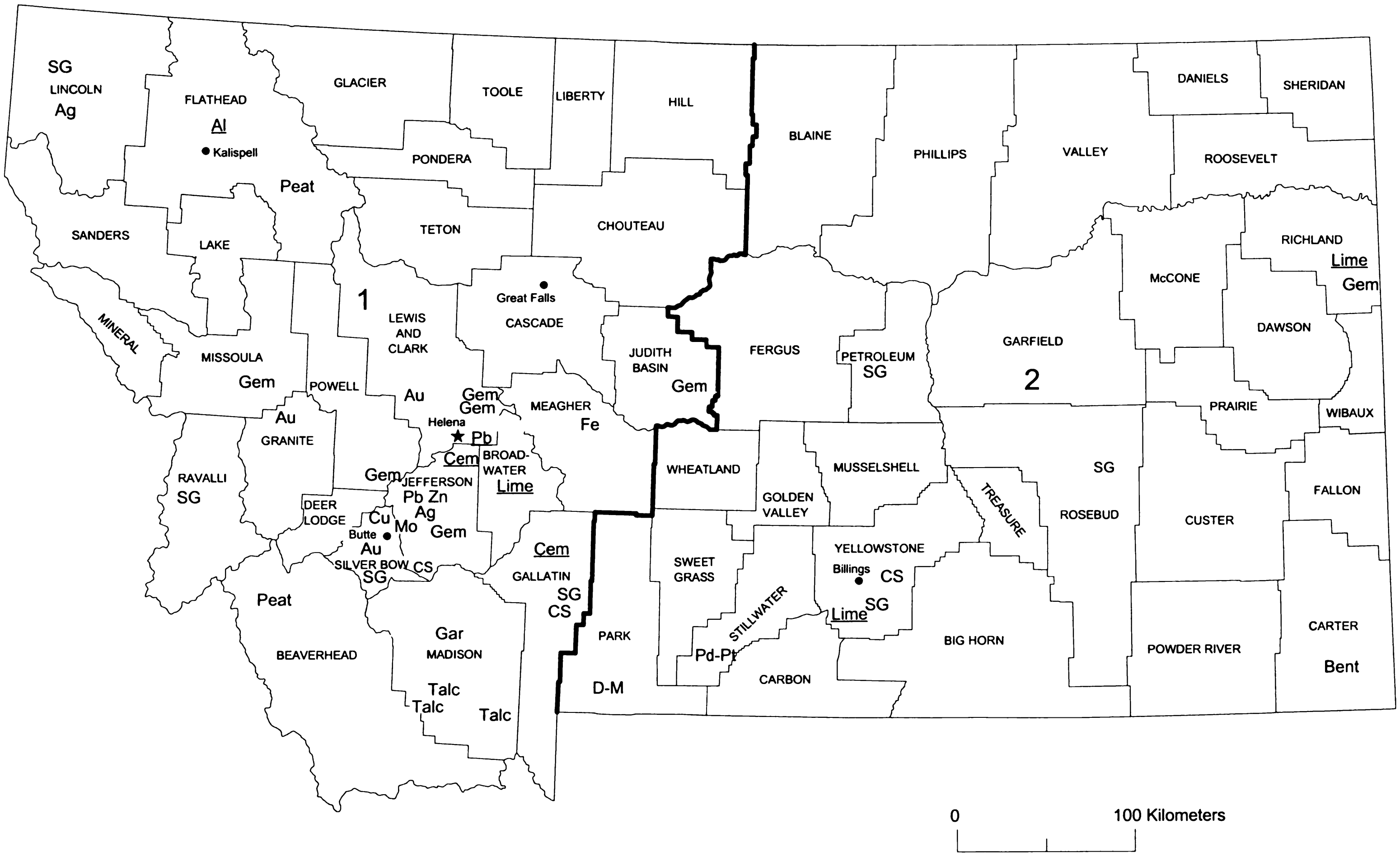
3/ Includes plaster and gunite sands.

4/ Includes fill and snow and ice control.

5/ Includes filtration and roofing granules.

6/ Reported and estimated production without a breakdown by end use.

MONTANA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 ━━ Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Al	Aluminum plant
Au	Gold
Bent	Bentonite
Cem	Cement plant
Cu	Copper
CS	Crushed stone
D-M	Dimension marble
Fe	Iron
Gar	Garnet
Gem	Gemstones
Lime	Lime plant
Mo	Molybdenum
Pb	Lead
Pb	Lead smelter
Pd-Pt	Palladium-platinum
Peat	Peat
SG	Sand and gravel
Talc	Talc
Zn	Zinc

Source: Montana Bureau of Mines and Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF MONTANA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Montana Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Montana was $491 million, according to the U.S. Geological Survey (USGS). This was a 3% decrease from that of 1998,[2] following a 1.8% increase in 1998 from that of 1997. The State decreased in rank to 30th from 28th in the Nation in nonfuel mineral production value, of which Montana accounted for about 1% of the U.S. total.

Overall, metallic minerals accounted for more than 70% of the State's total nonfuel mineral value. By value, palladium was Montana's leading nonfuel mineral, followed by copper, gold, and portland cement. In 1999, most of the State's drop in value resulted from decreases in the values of gold (down about $10 million), molybdenum and copper (down about $6 million each), and zinc (table 1). (All listings are in descending order of change or value.) Smaller yet significant decreases occurred in talc and platinum. Increases in palladium, construction sand and gravel, silver, and crushed stone values partially offset those decreases. All other changes were relatively small. In 1998, the increased values of palladium, up nearly $49 million, platinum, up $5.6 million, plus the smaller yet significant increases in construction sand and gravel, crushed stone, portland cement, and lime more than balanced decreases in gold, molybdenum, copper, zinc, and lead, resulting in a small overall gain for the year. All other changes were small and inconsequential to the net result.

Based upon USGS estimates of the quantities produced in the 50 States in 1999, Montana continued as the only U.S. producer of primary palladium and platinum. The State remained first in the production of talc; second in bentonite; third of three industrial garnet-producing States; fourth in lead; fifth in molybdenum and zinc; sixth in gold and silver; and eighth in gemstones. Montana increased in rank to fourth from fifth in the production of copper.

The Montana Bureau of Mines and Geology provided the narrative information that follows.[3] Montana Resources Inc., a copper-molybdenum producer, completed a new crushing circuit, allowing production to increase to 39,000 metric tons per day (t/d) of ore. The company purchased five used 150-metric-ton (t) Wabco trucks to allow for increased stripping necessary to maintain the higher ore production levels. Montana Resources also completed decommissioning of its copper leach pads. Currently, it is pumping 35,000 liters per minute of water from the abandoned Berkeley Pit to its precipitation plant for low-cost recovery of cement copper.

East of Butte, Placer Dome Inc.'s Golden Sunlight Mine completed installation of the Inco Cyanide Destruct Circuit, which will lower cyanide levels in its pond to approximately 10 parts per million. The mine has produced gold since 1981. The operation experienced two staff reductions targeting both professional and operational employees. Cash operating costs have been reported at $131 per troy ounce of gold. Without increases in the price of gold, the mine is expected to cease operations in 2002.

South of Helena, near Jefferson City, the Apollo Gold Co. continued operations at Montana Tunnels Mine. This is a low-grade gold-silver-lead-zinc operation. Open pit reserves are expected to become depleted in early 2000. The company will mine reserves left under the haul road for an additional 2 years. Metal prices will have to improve to justify mining additional underground reserves.

The Diamond Hill Mine, a satellite gold property of the Montana Tunnels Mine, reopened in fall 1999 after a lengthy closure. During the closure, an independent 540 t/d flotation circuit was constructed at the Montana Tunnels mill for processing the ore. The ore from the Diamond Hill Mine will continue to be hauled more than 80 kilometers (km) from Townsend to the Montana Tunnels property, where it will be crushed and processed. The mine reaches to a depth of 300 meters (m) for two ore bodies and to a depth of 150 m for another two; average grade is 8.6 grams per metric ton (g/t) of gold.

South of Billings, the Stillwater Mining Co. (SMC) continued to expand mining and milling operations and to further develop reserves in the J-M platinum/palladium reef of the Stillwater Complex. Near the east end of the reef, 8 km west of Nye, the company experienced production shortfalls due to a lack of development footage, and was mining only about 1,100 t/d of ore. Production targets of 2,700 t/d do not appear attainable until the first quarter of 2001. SMC contracted with Tyson Construction Co. during midsummer to help speed up development. The company also experienced high rates of turn over in labor and had difficulty hiring experienced miners. At the Nye site, SMC completed construction of new equipment repair bays and a warehouse, while expanding office space and other facilities. Capacity of the mill was expanded to 2,700 t/d, and an underground maintenance shop was constructed in the Stillwater Mine. A new pond at the Hertzler Ranch has been built but not yet lined. Slurry line construction was scheduled to start in 2000. On the west end of the reef, near Big Timber, SMC had two tunnel-boring machines advancing toward the mineralized reef from the East Boulder portal. Completion of those bores is expected within the second or third quarter of 2000. Delays were experienced during the year for a variety of reasons, the most predominant problems being unanticipated grouting and poor ground conditions. Construction was underway for most of the East Boulder surface facilities, but only the drying and warehouse facilities were functional. At Columbus, the company completed its new smelter building and expanded its base metal refinery to permit recovery of copper and nickel from the leach circuit. Commissioning of the facilities is expected to coincide with the startup of the East Boulder Mine and full production of the operations at Nye.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Robin B. McCulloch, Associate Research Mining Engineer, authored the text of mineral industry information submitted by the Montana Bureau of Mines and Geology.

Near Malta, the Zortman-Landusky Mine, formerly owned by Pegasus Gold, Inc., remains under maintenance while State and Federal regulatory agencies negotiate over a final reclamation plan. Many believe that the bond for reclamation will be consumed by maintenance costs before a consensus between the agencies can be reached.

Cominco American Resources Inc. decided in October 1999 to close its garnet operation at Alder. The property had been for sale for some time. The garnet operation was sold to Montana-Oregon Investment Group LLC effective December 31, 1999, and the name was changed to the Ruby Garnet Mine. Garnet shipments were suspended during December 1999, and the mine resumed production again in January 2000.

Near Three Forks, Luzenac America Inc. invested more than $3 million in equipment and facilities to enable its two talc processing plants to process imported ore. Upon completion, two plants in other States were closed and operations were consolidated in Montana where five new jobs were created.

Exploration activities in 1999 were at a record low with only 10 projects in the State funded. In contrast, 140 projects were funded during 1991. Estimated total exploration expenditures in 1999 were less than $100,000, whereas the industry spent $23.6 million in 1989. At the beginning of the decade, most projects depended on corporate funds. At the end, the financing was largely "out-of-pocket" by a few entrepreneurs and small local companies.

Kennecott Corp. drilled a strata-bound copper-silver target near Thompson Falls, in Sanders County, while Phelps Dodge Corp. drilled a porphyry copper target south of Dillon. Both projects were dropped.

Yukon Mining explored flat-lying, gold-copper-sulfide bodies near Utica. Caboose Mining drilled two holes near Radersburg on narrow gold veins. Don Deem tested high elevation placer benches near Melrose. The gravel assayed 1% lead and zinc and yielded coarse gold. Ingenuity Exploration drilled geophysical targets east of Melrose on the Hecla properties. Historic production in the district was from lead-silver ore bodies that assayed in excess of 34,000 g/t silver.

West of White Sulphur Springs, Nevada Pacific Gold Ltd. completed a four-hole, 900-m drill program in a buried ultramafic intrusive. Results indicated platinum-palladium mineralization (0.21 g/t) in a magnetite host. West of Norris, Nevada Colca Gold Inc. trenched and drilled the Revenue property. Although the results were favorable, the company was unable to secure venture capital. A similar situation occurred east of Boulder where Treminco Resources, Ltd. failed to secure funding on a proven reserve (Santa Fe Pacific Gold-Newmont Mining Corp.'s Elkhorn property, also known as the East Butte Mine).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN MONTANA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Gemstones		NA	1,120	NA	453	NA	398
Gold 3/	kilograms	10,200	109,000	8,200	77,900	7,600	68,400
Iron ore, usable		--	--	W	W	7	130
Lead 3/	metric tons	9,230	9,470	7,310	7,300	8,510	8,200
Palladium	kilograms	8,400	49,700	10,600	98,600	10,200	105,000
Platinum	do.	2,610	33,200	3,240	38,800	3,200	37,600
Sand and gravel: Construction		8,390	30,800	8,550	34,900	8,940	37,300
Stone: Crushed		2,600	10,600	3,880	15,100	4,100	16,300
Zinc 3/	metric tons	W	W	24,900	28,200	W	W
Combined values of cement, clays (bentonite, common), copper, garnet (industrial), lime, molybdenum, peat, sand and gravel [industrial, (1997)], silver, stone (dimension miscellanous), talc and pyrophyllite, and values indicated by symbol W		XX	254,000	XX	206,000 r/	XX	218,000
Total		XX	498,000	XX	507,000 r/	XX	491,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable. -- Zero.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
MONTANA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	23	2,020	$8,620	$4.27	15	3,370	$13,200	$3.91
Sandstone and quartzite	5	W	W	W	4	W	W	3.35
Traprock	3	W	W	W	3	W	W	3.84
Miscellaneous stone	2 r/	111 r/	137 r/	1.23 r/	5	73	242	3.31
Total or average	XX	2,600	10,600	4.09	XX	3,880	15,100	3.88

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch): Riprap and jetty stone	25	$156	$6.24
Coarse aggregate, graded:			
Bituminous aggregate, coarse	W	W	5.50
Bituminous surface-treatment aggregate	67	191	2.85
Railroad ballast	W	W	3.86
Total or average	456	1,820	3.98
Coarse and fine aggregates:			
Graded road base or subbase	W	W	3.31
Unpaved road surfacing	W	W	2.87
Other coarse and fine aggregates	11	47	4.27
Total or average	214	701	3.28
Other construction materials	30	99	3.30
Agricultural: Agricultural limestone	(3/)	(3/)	6.52
Chemical and metallurgical:			
Cement manufacture	W	W	3.31
Lime manufacture	W	W	4.55
Total or average	2,380	9,690	4.07
Special: Mine dusting or acid water treatment	(3/)	(3/)	3.58
Unspecified: 4/			
Actual	73	242	3.32
Estimated	672	2,220	3.31
Total or average	745	2,470	3.31
Grand total or average	3,880	15,100	3.88

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes limestone, miscellaneous stone, sandstone and quartzite, and traprock.

3/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
MONTANA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	25	156	--	--	--	--
Coarse aggregate, graded 3/	W	W	W	W	--	--
Coarse and fine aggregate 4/	W	W	W	W	--	--
Other construction materials	30	99	--	--	--	--
Agricultural 5/	W	W	--	--	--	--
Chemical and metallurgical 6/	2,380	9,660	--	--	--	--
Special 7/	W	W	--	--	--	--
Unspecified: 8/						
Actual	--	--	7	23	66	219
Estimated	70	230	602	1,990	--	--
Total	2,970	11,900	840	2,940	66	219

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes riprap and jetty stone.

3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, and railroad ballast.

4/ Includes graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

5/ Includes agricultural limestone.

6/ Includes cement manufacture and lime manufacture.

7/ Includes mine dusting or acid water treatment.

8/ Reported and estimated production without a breakdown by end use.

TABLE 5
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,230	$5,850	$4.74
Plaster and gunite sands	2	4	2.00
Asphaltic concrete aggregates and other bituminous mixtures	1,260	8,200	6.52
Road base and coverings	2,840	10,600	3.74
Fill	468	792	1.69
Snow and ice control	307	1,170	3.80
Filtration	23	42	1.83
Other miscellaneous uses 2/	28	162	5.79
Unspecified: 3/			
Actual	431	1,660	3.86
Estimated	1,960	6,430	3.28
Total or average	8,550	34,900	4.08

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes railroad ballast.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
MONTANA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts 2/	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates 3/	889	3,530	347	2,320	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,020	6,780	237	1,420	--	--
Road base and coverings	2,100	7,690	735	2,920	--	--
Fill	405	545	63	247	--	--
Other miscellaneous uses 4/	339	1,250	19	124	--	--
Unspecified: 5/						
Actual	176	672	33	119	222	871
Estimated	1,310	4,190	652	2,240	--	--
Total	6,240	24,700	2,090	9,390	222	871

1/ Data are rounded to no more than three significant digits; may not add to totals shown. – Zero.

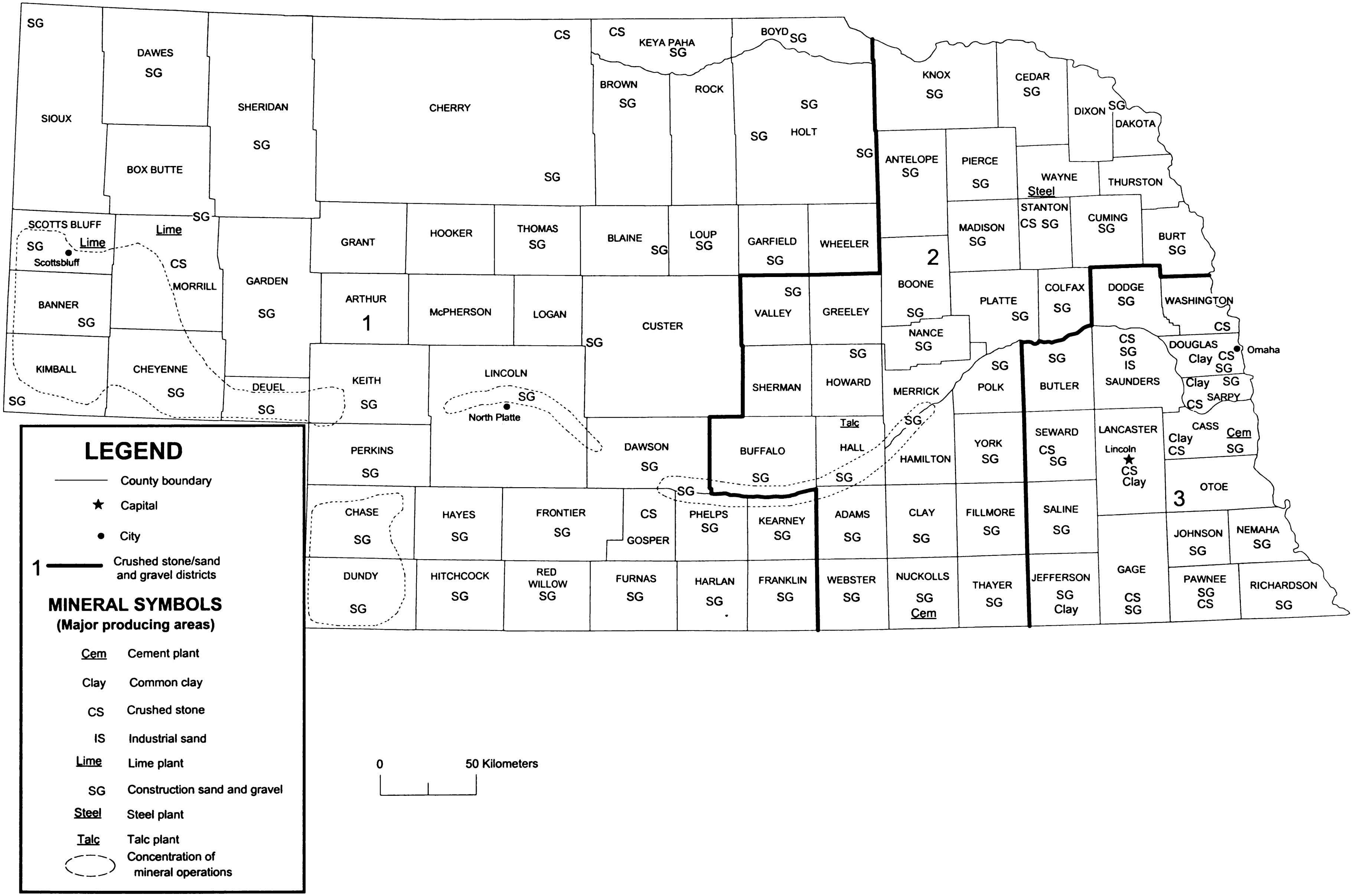
2/ Includes production within the State with no district reported.

3/ Includes plaster and gunite sands.

4/ Includes filtration, railroad ballast, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

NEBRASKA



Source: University of Nebraska-Lincoln, Nebraska Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEBRASKA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Nebraska-Lincoln, Nebraska Geological Survey, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Nebraska was $96.4 million, according to the U.S. Geological Survey (USGS). Because data for portland and masonry cement and industrial sand and gravel for 1998 and 1999 have been withheld to protect company proprietary data, the actual total values are significantly higher for those years than those reported in table 1.[2] The State's total nonfuel mineral production value showed an increase from 1997 to 1998 followed by a small decrease in 1999 from that of 1998. Nebraska's leading nonfuel minerals in descending order of value were portland cement, construction sand and gravel, and crushed stone, the latter two being of nearly equal value (table 1).

Decreases that occurred in the values of portland cement and crushed stone accounted for most of the drop in the State's total value in 1999. Construction and industrial sand and gravel and masonry cement showed small increases. In 1998, a rise in the value of portland cement plus a smaller increase in crushed stone were responsible for most of Nebraska's increase for the year. Metals produced in the State, mostly that of raw steel, were processed from materials acquired from other domestic and foreign sources. Uranium was in situ leach mined at one location in northwestern Nebraska but this information is not included in this publication because uranium is classified as an energy or fuel mineral.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEBRASKA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	189	675	134	345	135	342
Gemstones	NA	3	NA	3	NA	3
Lime	17	1,360	19	1,580	19	1,580
Sand and gravel: Construction	13,700	46,700	13,800	47,000	13,700	47,500
Stone: Crushed	6,900	46,000	7,490	49,800	6,900	47,100
Total 3/	XX	94,800	XX	98,700	XX	96,400

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Partial total, excludes values of cement (portland and masonry) and sand and gravel (industrial) that must be concealed to avoid disclosing company proprietary data.

TABLE 2
NEBRASKA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	11	6,900	$46,000	$6.67	11	7,490	$49,800	$6.65

1/ Data are rounded to no more than three significant digits.

TABLE 3
NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/

Use	Quantity (thousand (metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	159	$1,540	$9.70
Filter stone	4	33	8.25
Other coarse aggregate	295	2,420	8.21
Total or average	458	4,000	8.73
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.90
Bituminous aggregate, coarse	W	W	7.35
Railroad ballast	W	W	6.08
Total or average	1,180	9,030	7.63
Fine aggregate (-3/8 inch): Screening, undesignated	(2/)	(2/)	3.41
Coarse and fine aggregates:			
Graded road base or subbase	43	318	7.40
Unpaved road surfacing	477	4,020	8.43
Crusher run or fill or waste	514	3,820	7.43
Total or average	1,030	8,150	7.89
Agricultural:			
Agricultural limestone	560	4,770	13.85
Other agricultural uses	96	426	4.44
Total or average	656	5,190	7.91
Chemical and metallurgical:			
Cement manufacture	(2/)	(2/)	4.15
Flux stone	(2/)	(2/)	11.09
Special: Asphalt fillers or extenders	(2/)	(2/)	6.60
Other miscellaneous uses: Pipe bedding	66	438	6.64
Unspecified: 3/			
Actual	2,340	15,500	6.61
Estimated	148	895	6.05
Total or average	2,550	16,800	6.58
Grand total or average	7,490	49,800	6.65

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEBRASKA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 3 Quantity	District 3 Value
Construction aggregates:		
Coarse aggregate (+1 1/2 inch) 3/	457	4,000
Coarse aggregate, graded 4/	1,180	9,030
Fine aggregate (-3/8 inch) 5/	W	W
Coarse and fine aggregate 6/	1,030	8,150
Other miscellaneous uses: Pipe bedding 7/	66	438
Agricultural 8/	655	5,190
Chemical and metallurgical 9/	W	W
Special 10/	W	W
Unspecified: 11/		
Actual	2,340	15,500
Estimated	147	895
Total	7,490	49,800

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported in Districts 1 and 2.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes bituminous aggregate (coarse), concrete aggregate (coarse), and railroad ballast.

5/ Includes screening (undesignated).

6/ Includes crusher run (select material or fill), graded roadbase or subbase, unpaved road surfacing.

7/ Includes pipe bedding.

8/ Includes agricultural limestone and other agricultural uses.

9/ Includes cement manufacture and flux stone.

10/ Includes asphalt fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,100	$6,840	$3.25
Plaster and gunite sands	74	256	3.46
Concrete products (blocks, bricks, pipe, decorative, etc.)	107	401	3.75
Asphaltic concrete aggregates and other bituminous mixtures	1,050	3,400	3.24
Road base and coverings 2/	2,400	7,430	3.10
Fill	893	1,600	1.79
Snow and ice control	80	273	3.41
Railroad ballast	65	217	3.34
Roofing granules	32	341	10.66
Other miscellaneous uses 3/	23	113	4.91
Unspecified: 4/			
Actual	1,230	4,180	3.40
Estimated	5,780	21,900	3.79
Total or average	13,800	47,000	3.40

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
NEBRASKA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts 2/	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products	W	W	413	1,300	W	W	--	--
Plaster and gunite sands	W	W	16	44	W	W	--	--
Asphaltic concrete aggregates and road base materials 3/	1,240	3,080	1,550	4,790	653	2,960	--	--
Fill	287	393	297	720	308	483	--	--
Snow and ice control	W	W	38	137	W	W	--	--
Other miscellaneous uses 4/	22	73	71	229	28	368	--	--
Unspecified: 5/								
Actual	264	613	102	329	861	3,240	--	--
Estimated	481	1,500	2,540	8,700	2,720	11,600	46	168
Total	2,820	7,080	5,020	16,300	5,950	23,500	46	168

W Withheld to avoid disclosing company proprietary data;0 included with "Other miscellaneous uses." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

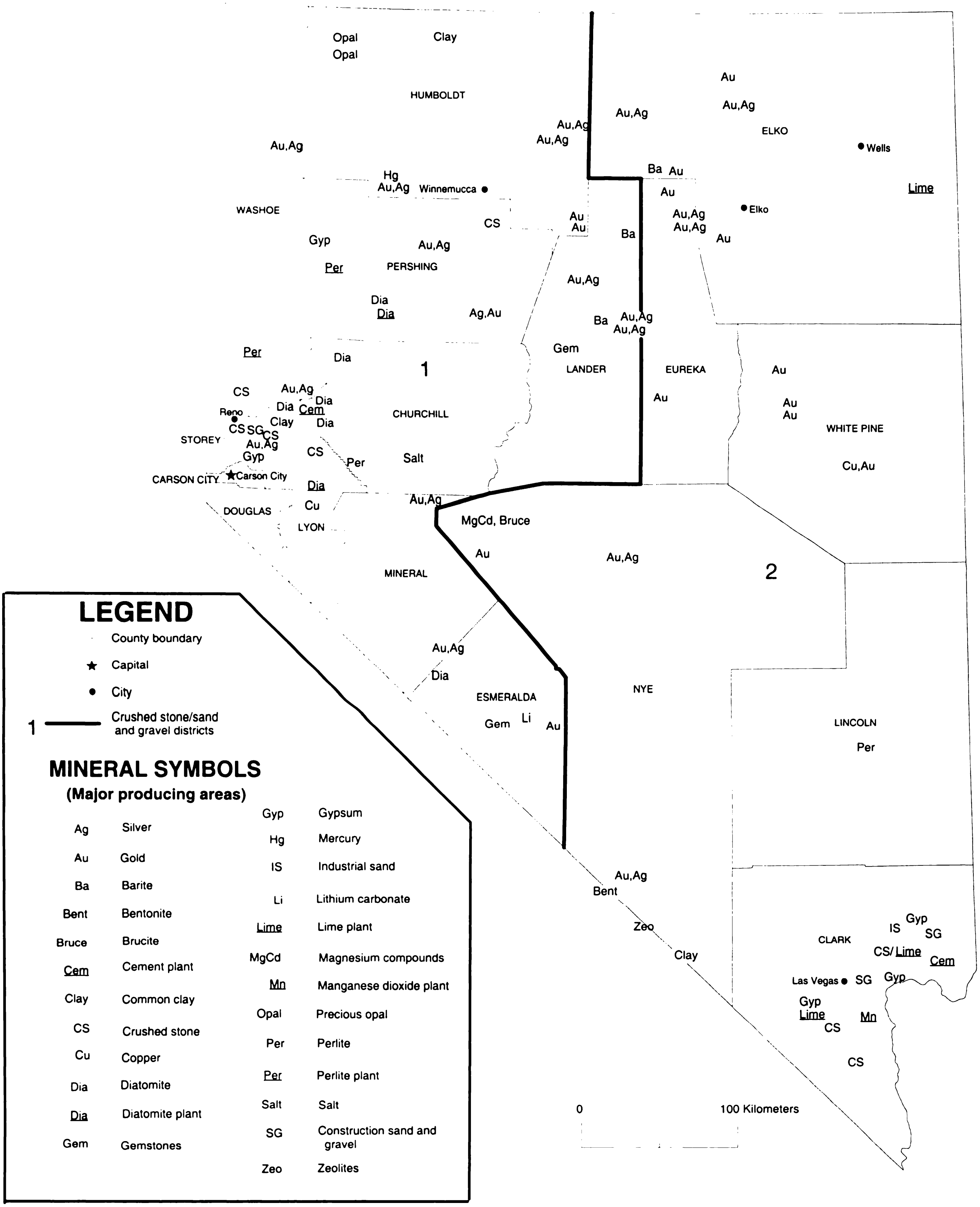
2/ Includes production within the State with no district reported.

3/ Includes road and other stabilization (cement).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

NEVADA



LEGEND

·	County boundary
★	Capital
●	City
1 ―	Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Ba	Barite
Bent	Bentonite
Bruce	Brucite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Dia	Diatomite
Dia	Diatomite plant
Gem	Gemstones
Gyp	Gypsum
Hg	Mercury
IS	Industrial sand
Li	Lithium carbonate
Lime	Lime plant
MgCd	Magnesium compounds
Mn	Manganese dioxide plant
Opal	Precious opal
Per	Perlite
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Zeo	Zeolites

Source: Nevada Bureau of Mines and Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEVADA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Nevada Bureau of Mines and Geology for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Nevada was $2.78 billion, according to the U.S. Geological Survey (USGS). This was a 12% decrease from that of 1998,[2] and followed a 3.1% decrease in 1998 from 1997. The State was second in the Nation (first in 1998) in nonfuel mineral production value, of which Nevada accounted for more than 7% of the U.S. total.

Nevada, the Nation's leading State in gold production and second-leading State in silver production, provided 74% and 27% of the Nation's gold and silver, respectively. The "Silver State" has been first in gold production since 1981, and, except 1999, first in silver since 1987. In 1999, gold accounted for more than 82% of Nevada's nonfuel mineral value, but the precious metal also accounted for the largest portion of the State's drop in value. The total value of gold decreased by $300 million, in part because of reduced production, but more so owing to overall lower prices for gold during the year (table 1). Other nonfuel minerals that had significant decreases included copper, down about $83 million; silver, down about $25 million; and construction sand and gravel, down about $8 million. Relative to these changes, small yet significant increases occurred in lime (up about $5 million), crushed stone (up $3 million), portland cement, and diatomite. All other nonfuel minerals showed changes in value of less than $1 million. In 1998, decreases in the values of copper, silver, lithium minerals, gold, and crushed stone (descending order of change in value), totaling about $102 million, accounted for most of the State's decrease in value for the year (table 1). Barite and diatomite values also decreased, about $4 million and $5 million, respectively. Nonfuel mineral values that increased included a $4 million rise in construction sand and gravel and an increase of about $1 million each in portland cement and gypsum; all other changes were small relative to these.

Based upon USGS estimates of quantities produced in the 50 States during 1999, Nevada was the only State to produce lithium minerals, magnesite, brucite, and mercury. The State remained second of two diatomite-producing States, sixth in gypsum and perlite, and seventh in lime. Nevada went down in rank to second from first in silver and to fifth from fourth in copper. Additionally, significant quantities of construction and industrial sand and gravel were produced in the State.

The following narrative information was provided by the Nevada Bureau of Mines and Geology (NBMG).[3] Production data in the following text are those reported by the NBMG, based upon its own surveys, estimates, and information gathered from company annual reports. The NBMG data are reported by that agency to be nonproprietary data and may differ from some USGS preliminary estimates and production figures as reported to and estimated by the USGS.

Nevada produced 257,000 kilograms (kg) of gold in 1999 along with 607,000 kg of silver. Newmont Mining Corp.'s Nevada operations, which include the Carlin Trend mines, the Lone Tree complex, Twin Creeks, and one-half of the production from the Rosebud Mine, reported production of 75,974 kg in 1999, down from 86,144 kg in 1998. Newmont maintained its place as the largest gold-producing company in Nevada, while Barrick Gold Corp. remained in second place, producing 65,559 kg of gold in 1999. Barrick Gold's Betze-Post Mine lost its place as the largest Nevada gold mine and was replaced by Placer Dome Inc.'s Cortez operation (Pipeline Mine), which produced 41,321 kg in 1999. Betze-Post production in 1999 was 35,150 kg, but Barrick's Meikle underground mine reported 1999 production of 30,399 kg gold, up from 26,354 kg in 1998. Other major gold producers in 1999 included Smoky Valley Common Operation's Round Mountain Mine, 16,852 kg; Independence Mining Co.'s Jerritt Canyon Mine, 11,291 kg; Franco-Nevada Mining Corp.'s Ken Snyder Mine, 5,672 kg; Florida Canyon Mining Co.'s Florida Canyon Mine, 4,342 kg; Echo Bay Minerals Co., 3,872 kg from its McCoy/Cove operation; and Homestake Mining Co.'s Ruby Hill Mine, 3,852 kg (Tingley and LaPointe, 2000).

Echo Bay's McCoy/Cove Mine was Nevada's largest silver producer in 1999, producing 262,000 kg. The Rochester Mine, operated by Coeur d'Alene Mines Corp., produced 192,692 kg silver, and Franco-Nevada Mining Corp.'s Ken Snyder Mine produced 57,874 kg. Other large silver-producing operations included the Denton-Rawhide Mine, 20,700 kg; the Round Mountain Mine, 14,445 kg; Barrick Gold Corp.'s Meikle Mine, 8,187 kg; and the Rosebud Mine, operated by Hecla Mining Co., 7,711 kg (Tingley and LaPointe, 2000).

Concentrates containing 28,011 metric tons (t) of copper, along with 816 kg gold, and 4,762 kg silver, were shipped by BHP Copper Co. from its Robinson Mine in White Pine County.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Joseph V. Tingley and Daphne D. La Pointe, Research Geologists, co-authored the text of mineral industry information provided by the Nevada Bureau of Mines and Geology.

Following an announcement that it would cease operations at all of its North American properties by the end of August, BHP ceased production at Robinson at the end of June.

Two new gold mines came into production in Nevada in 1999. Franco-Nevada Mining Corp.'s Ken Snyder Mine in Elko County produced its first gold in December 1998, but it did not officially begin production until February 1999, and can be counted as a 1999 startup. Newmont Mining Corp.'s Trenton Canyon Mine, one of the Lone Tree complex mines, began production in May 1999. The continuing low price for gold took its toll on Nevada's gold-mining industry. Most of the mining operations cut staff and production, as evidenced by Nevada's lowered annual gold output. Alta Gold Co. declared bankruptcy in 1999, and closed its operations at the Griffon Mine in White Pine County and the Olinghouse Mine in Washoe County. These mines opened in 1998 and closed within less than a year.

The total value of industrial minerals produced in Nevada in 1999, an estimated $381 million, was about 2% above the value in 1998. In order of estimated value, the most important minerals in 1999 were construction aggregate, lime, diatomite, gypsum, cement, barite, lithium, silica, magnesia, and clay, each valued at more the $5 million. Commodities with values of less than $5 million were dolomite, limestone, perlite, salt, and brucite. Colemanite and zeolite were processed in Nevada from ore mined nearby in California.

In 1999, construction aggregate production in Nevada had an approximate total value of $130 million and was ranked second among the State's mined commodities behind gold. For 1999, State aggregate production was estimated at 26 million metric tons (Mt), nearly 10% more than in 1998. Aggregate produced from sand and gravel deposits accounted for about 80% of aggregate production Statewide, with crushed stone and lightweight aggregate making up the balance. Aggregate produced in the Las Vegas area, estimated at about 18 Mt, increased about 18% from 1998; this increase may be due, in part, to more complete data for 1999. Production from portable crushers at construction sites throughout the Las Vegas basin makes calculations of the total difficult. Production in the Reno-Sparks-Carson City area, at about 5.4 Mt, was also higher than in 1998.

Companies in the Las Vegas area that produced more than 1 Mt of aggregate in 1997, ranked in approximate order of tonnage produced, were Las Vegas Paving Corp., Nevada Ready Mix Corp., CSR America Inc. (formerly WMK Transit Mix Inc.), Hanson Aggregates West (formerly Bonanza Materials Inc.), and Blue Diamond Materials Co. Other important producers were Frehner Construction Co., Inc., Wells Cargo Inc., Granite Construction Co., and Gornowich Sand and Gravel, Inc. The largest Las Vegas producer, Las Vegas Paving Corp., mostly mined aggregate from the new Las Vegas landfill and from a pit in the Lone Mountain area. Nevada Ready Mix Corp., the second leading producer, mined most of its aggregate from an open pit in an alluvial fan in the Lone Mountain area. Hanson Aggregates West (formerly Bonanza Materials) shut down its Stephanie Pit operation in Henderson in 1999 and now produces mainly from granite mined near Railroad Pass. Community pits and other aggregate mining facilities administered by the U.S. Bureau of Land Management and operated by several companies provided about 3 Mt to the Las Vegas area total in 1999.

In 1999, sand and gravel operations accounted for about 85% of aggregate used in the Las Vegas metropolitan area, with crushed stone and lightweight aggregate making up the balance. Major crushed stone producers in the Las Vegas area were Hanson Aggregates West, Frehner Construction Co., Inc., Granite Construction Co., and Southern Nevada Lightweight.

For years, the largest source of Las Vegas aggregate has been near Lone Mountain northwest of Las Vegas. Once a comfortable distance from residential areas, Lone Mountain operations have been subjected to public criticism mostly related to dust and traffic problems. Although significant production still comes from sites located in more heavily urbanized parts of the metropolitan area, such as the Buffalo Road area in the southwestern part of Las Vegas, it is likely that future production will come increasingly from more distant sources. The new landfill in Apex near Interstate 80 about 16 kilometers (km) northeast of Las Vegas has recently become a large aggregate production area, and aggregate is being hauled as far as 80 km from sites in Lincoln County.

In the Reno-Sparks-Carson City area, Granite Construction Co. and All-Lite Aggregate Co. produced more than 900,000 t of aggregate in 1999. Companies that produced 450,000 t or more in 1999 included Rocky Ridge Inc. and Rilite Aggregate Co. Paiute Pit Aggregates and A&K Earthmovers Inc. were also important producers. Crushed rock continued to be an important source of aggregate in this area; crushed rock operations of Granite Construction, Rocky Ridge Inc., and Frehner Construction, and lightweight rhyolite aggregate from All-Lite Aggregate Co., Rilite Aggregate Co., and Naturalite Aggregate Corp. accounted for about 65% of the aggregate used in 1999 in the Reno-Sparks-Carson City area.

Barite shipments from Nevada totaled 324,000 t, about 25% less than in 1998. Production slipped considerably in recent years (from about 540,000 t in 1996), and was far below the more than 900,000 metric tons per year (t/yr) produced between 1977 and 1982. Active barite producers now number 4, compared with more than 20 companies in the early 1980's. Low-priced imports of Chinese barite into the gulf coast were the main reason for the long-term Nevada decline, although Nevada barite remained highly competitive for drilling uses in terms of specific gravity and chemical purity. Somewhat higher production is expected for 2000 due to increases in North American gaswell drilling in late 1999.

M.I. Drilling Fluids Co., now owned by Smith International Inc. (60%) and Schlumberger Ltd. (40%), was again the largest Nevada barite producer, with combined production of more than 180,000 t of screened and crushed high-grade ore from the Greystone Mine and ground and bagged barite from its Battle Mountain plant, both in Lander County. In late 1998, Halliburton Co. acquired the Baroid Drilling Fluids Rossi Mine (owned briefly by Dresser Industries Inc.) in Elko County, and in 1999 continued shipments of drill-grade barite from that property and the Dunphy processing plant in Eureka County. Baker Hughes Inteq, a division of Baker Hughes Inc., produced barite from its Argenta property (previously a Millpark operation) near Battle Mountain in Lander County.

Standard Industrial Minerals Inc. shipped a small amount of barite in 1999 from a deposit of white bedded barite at the P and S Mine in Nye County to a processing plant in Bishop, CA. The company markets high-value, finely ground (400-mesh), white, paint-grade barite with brightness in excess of 80%.

American Borate Co. mined borate minerals from an underground operation in Death Valley, CA, in 1999. The ore was processed at the Lathrop Wells mill in Nye County, but because the ore was from out of State, this production was not included in the estimate of total value of Nevada minerals.

The Nevada Cement Co., a subsidiary of Centex Construction Products, Inc. produced portland cement at a plant at Fernley in Lyon County. Annual production exceeded 450,000 t of cement. Limestone was mined from Cenozoic lacustrine deposits south of Fernley, and other ingredients came mostly from northern Nevada.

In 1999, Royal Cement Co. refurbished and restarted an idle plant near Logandale in Clark County. Limestone was mined at a site near the plant; other raw materials were purchased from regional suppliers. Anticipated production was in the 230,000 t to 270,000 t range.

Nevada clay production increased slightly from 1998 to 1999. IMV Nevada, owned by Mud Camp Mining Co., mined about 30,000 t of sepiolite and saponite from deposits in Neogene lacustrine sediments in the Ash Meadows area of Nye County. The company's processing plant in Amargosa Valley exported a variety of clay products worldwide. It was the only producer of sepiolite and saponite in the United States.

Other Nevada producers shipped relatively minor amounts of clay minerals. Vanderbilt Minerals Co. shipped a small amount of clay from widely scattered Nevada deposits from a crushing plant at the New Discovery Mine near Beatty in Nye County in 1999. American Colloid Co. shipped some clay in 1999, including white bentonite from Coal Canyon near Lovelock in Pershing County and hectorite from the Disaster Peak deposit in Humboldt County. The Art Wilson Co. sold less than 90 t of montmorillonite from the Jupiter Mine in Lyon County in 1999 for aquaculture. The company also mined halloysite clay from a deposit in Washoe County for Nevada Cement Co.; however, the halloysite was not reported as clay in NBMG mineral production figures because it was included in portland cement.

In 1999, Oil Dri Corp. which had been producing cat litter for more than 30 years and produced about 25% of the cat litter used in the United States, announced the discovery of a large montmorillonite clay deposit in Hungry Valley north of Reno. The clay was considered to be excellent material for cat litter, and the company was proceeding with permitting despite local opposition.

Specialty Clays Corp. of Reno continued development of a deposit of montmorillonite in Churchill County about 19 km southeast of Fallon, stripping overburden, stockpiling clay, and building a drying and screening plant in 1999. The clay was reportedly comparable to Na-montmorillonite from Wyoming, and the company hoped to market it for drilling and environmental uses.

Eagle-Picher Minerals, Inc., a division of Eagle-Picher Industries, Inc., produced most of Nevada's diatomite at three different operations. The largest was the Colado operation in Pershing County, which consists of a plant east of Lovelock that produces diatomaceous earth filtration products from beds of pure diatomite mined northwest of Lovelock. The company also produced diatomite that is mainly used in fillers and absorbents at its Clark plant and mine in Storey County, and diatomite that is used in insulation was produced from a pit near Hazen in Lyon County. The company was recently named Nevada Exporter of the Year on the basis of its strong international performance.

Moltan Co. of Tennessee was the second largest diatomite miner in Nevada, producing cat litter, oil absorbent, and soil conditioner from diatomite mined in Churchill County northeast of Fernley. Other companies that produced diatomite in Nevada in 1999 were CR Minerals Corp. at Hazen in Lyon County and Grefco Inc. at its Basalt operation near the Esmeralda/Mineral County line.

Nevada Neanderthal Stone had quarried and cut Tertiary tuff near Beatty in Nye County for floor tile and other stone products for about 10 years. The operation ceased production in 1999 because of drastic sales declines due to competition from material imported from Mexico following ratification of the North American Free Trade Agreement (NAFTA). Decorative stone was produced at several Nevada sites. Las Vegas Rock, which mainly produces crushed landscape rock, produced some sandstone building stone at Goodsprings in Clark County. In 1999, Mount Moriah Stone, of Baker, renewed production of quartzite from quarries in eastern White Pine County under new ownership. The company reportedly produced over 900 t of stone for flagstone, ashlar, and other uses during the year.

Gypsum production in Nevada increased to 1.9 Mt in 1999 from 1.6 Mt in 1998. PABCO Gypsum in Clark County east of Las Vegas was the largest producer, mining over 900 Mt of ore in 1999; however, actual gypsum production was lower because the ore must be beneficiated to produce a gypsum concentrate. PABCO processed most of this gypsum into wallboard at a plant adjacent to the mine, and also made plaster. The Blue Diamond operation of James Hardie Gypsum Co., just southwest of Las Vegas in Clark County, was the second largest producer at about 590,000 t in 1999. USG Corp., which mined gypsum in northern Pershing County, was the third largest producer at about 530,000 t. USG processed the gypsum into wallboard and plaster at its Empire plant in northern Washoe County. The Art Wilson Co., Carson City, shipped about 132,000 t of gypsum and anyhdrite from the Adams Mine in Lyon County for use in cement and agricultural markets. The company was finalizing plans for adding a bagging plant.

In 1999, lime production in Nevada continued at record levels, increasing 10% from that of 1998. Lime was produced from Devonian limestone deposits that were at nearly opposite ends of the State. The Continental Lime, Inc. Pilot Peak high-calcium lime operation near Wendover in Elko County shipped the most lime in 1999, mainly to Nevada gold-mining operations for use in pH control. The Pilot Peak plant, which began as a one-kiln operation in 1989, now consists of three kilns, with a combined capacity of more than 630,000 t/yr of quicklime, and a hydrated lime plant capable of producing 320 metric tons per day.

Chemical Lime Co. produced lime at Apex near Las Vegas. The operation mainly produced high-calcium quicklime used in metallurgical processing, paper manufacturing, and environmental markets. The operation also produced dolomitic lime and hydrated high-calcium lime, mainly for use in construction. Chemical Lime also produced dolomitic hydrate at its plant at Henderson, although the lime kiln was idle in 1999. In late 1997, Chemical Lime shut down its dolomite mining operation at Sloan, south of Las Vegas, where limestone and dolomite had been mined since 1910. Frehner Construction

Co., Inc., purchased the Sloan property, and was producing construction aggregate from limestone at the site.

In addition to lime, both Continental Lime, Inc. and Chemical Lime shipped crushed limestone. Other carbonate rock producers in Nevada were Min-Ad, Inc. and Nutritional Additives Corp., producers of agricultural dolomite near Winnemucca in Humboldt County. Min-Ad, the larger of the two, shipped about 58,000 t of ground dolomite in 1999, a slight increase from that of 1998.

In late 1998, a subsidiary of the giant international company Metallgesellschaft AG purchased the Silver Peak, Esmeralda County, lithium operation from Cyprus Amax Minerals Co., changing the operator name from Cyprus Foote Mineral Co. to Chemetall Foote Co. The operation, active since 1965, produced lithium carbonate and lithium hydroxide compounds from brine. The brine was pumped from beneath Clayton Valley playa and evaporated in nearby ponds. In recent years, the Nevada operation benefited from increasing prices, but a new lithium brine operation in South America caused price reductions for large orders of lithium carbonate from about $2.00 per pound to about $0.90 per pound during 1998. In 1999, the bulk price rebounded to about $1.30 per pound. On the basis of U.S. Securities and Exchange Commission information, production at Silver Peak for 1998 was estimated at 5,400 t lithium carbonate and 2,300 t lithium hydroxide.

Production of magnesia from magnesite at Gabbs in Nye County by Premier Services Corp. was nearly 15% more in 1999 than in 1998. Magnesite and brucite deposits in the Gabbs area had a production history of more than 30 years; for most of this time, including a period of magnesium metal production during World War II and refractory production until the 1980's, the operator was Basic Inc. The magnesia produced presently by the Gabbs plant was light-burned magnesia, which was mainly used in agriculture. Relatively small amounts of brucite were also shipped from Gabbs.

In 1999, Eagle-Picher Minerals, Inc. produced expanded perlite at the Colado diatomaceous earth facility in Pershing County from perlite that was mined at the Popcorn Mine in Churchill County. The perlite was marketed as a filter aid, and plant capacity was reportedly about 7,000 t/yr.

The Wilkin Mining and Trucking Co. mined perlite from the Mackie Mine in Lincoln County. In the past, most of the perlite was shipped as crude; however, the company built a small popping plant in Caliente in 1987, and now sales are almost exclusively expanded perlite. In 1999, shipments totaled about 1,800 t, mainly of large sizes of perlite (including the difficult-to-obtain #4 size) for horticultural uses.

The Huck Salt Co. produced about 14,000 t of salt in 1999. The salt, mined from a playa deposit on Fourmile Flat near Fallon in Churchill County, is now mainly used for de-icing roads. Salt has been harvested from this deposit more or less continuously since it was hauled to the mills that processed Comstock silver and gold ore in the 1860's.

Simplot Silica Products in Clark County shipped 614,000 t of silica sand in 1999, an increase of nearly 6% over the 1998 production. The sand was mined from a large deposit of friable Cretaceous sandstone, washed in the pit, and transported via a slurry pipeline to a plant at Overton where it was screened and bagged.

American Resource Corp. (formerly East West Minerals) processed clinoptilolite at a plant near Amargosa Valley in Nye County since 1985 when the facility was purchased from Anaconda Minerals. In 1998, American Resource was placed in receivership along with Rea Gold Corp., its parent company. Badger Mining Corp., a Wisconsin-based industrial mineral company, acquired the operation in 1999. The clinoptilolite, used in water filtration, odor control, and nuclear cleanup, was mined from a nearby deposit in California. The new owner had plans for plant expansion and development of a separate deposit in Nevada.

American Colloid Inc. sold the Eastgate plant in Churchill County to Nolind Industries, L.L.C. of California in 1998. The plant, acquired from American Resource Corp. in 1995, was originally constructed by East West Minerals in 1987 to process mordenite from Tertiary tuffaceous rocks into cat litter and absorbent products.

Metal exploration continued to suffer from the effects of depressed metal prices. Although activity was reported from 107 mining districts throughout the State compared with only 69 districts in 1998, the level of activity was still low. Exploration activity was concentrated along the major Battle Mountain-Eurkea Range, Pershing County, and, exploration was reported at historical platinum properties in the Bunkerville district, Clark County.

Reference Cited

Tingley, J.V., and LaPointe, D.D., 2000, Nevada, *in* Annual Review 1999: Mining Engineering, v. 52, no. 5, May, p. 76.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEVADA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	474	NA	159	NA	125
Gold 3/ kilograms	243,000	2,600,000	273,000	2,590,000	255,000	2,290,000
Sand and gravel: Construction	23,600	110,000	26,400	114,000	24,100	106,000
Silver 3/ metric tons	878	138,000	670	110,000	497	85,400
Stone: Crushed	5,150	41,800	6,320	34,000	6,700	37,000
Zeolites metric tons	(4/)	NA	(4/)	NA	NA	NA
Combined values of barite, brucite, cement (portland), clays (bentonite, fuller's earth, kaolin), copper, diatomite, gypsum (crude), iron ore [usable (1998-99)], lime, lithium minerals, magnesite, mercury (1997, 1999), perlite (crude), salt, sand and gravel (industrial)	XX	383,000	XX	320,000	XX	257,000
Total	XX	3,270,000	XX	3,170,000	XX	2,780,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content from ores, etc.

4/ Withheld to avoid disclosing company proprietary data.

TABLE 2
NEVADA: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7 r/	2,980 r/	$23,300 r/	$7.84 r/	8	4,090	$19,000	$4.64
Dolomite	3	W	W	14.67 r/	2	W	W	33.00
Granite	1	W	W	9.43 r/	2	W	W	7.72
Traprock	3 r/	W	W	2.44 r/	2	34	152	4.42
Volcanic cinder and scoria	2 r/	W	W	4.26 r/	2	W	W	4.23
Miscellaneous stone	4 r/	W	W	8.74 r/	4	1,630	11,000	6.76
Total or average	XX	5,150	41,800	8.12	XX	6,320	34,000	5.38

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	W
Filter stone	W	W	W
Other coarse aggregate	W	W	W
Total or average	38	$208	$5.47
Coarse aggregate, graded:			
Concrete aggregate, coarse	461	4,590	9.95
Bituminous aggregate, coarse	254	1,120	4.42
Bituminous surface-treatment aggregate	77	340	4.42
Other graded coarse aggregate	164	632	3.85
Total or average	956	6,680	6.99
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	7.96
Stone sand, bituminous mix or seal	W	W	3.88
Screening, undesignated	33	144	4.36
Other fine aggregate	7	26	3.71
Total or average	270	1,730	6.41
Coarse and fine aggregates:			
Graded road base or subbase	W	W	3.71
Unpaved road surfacing	W	W	4.45
Total or average	290	1100	3.80
Other construction materials	W	W	3.47
Agricultural:			
Agricultural limestone	W	W	33.36
Other agricultural uses	W	W	26.46
Total or average	63	2,050	32.49
Chemical and metallurgical:			
Cement manufacture	W	W	4.30
Lime manufacture	W	W	3.31
Flux stone	W	W	3.83
Sulfur oxide removal	W	W	3.96
Total or average	2,790	9,940	3.57
Special: Mine dusting or acid water treatment	(3/)	(3/)	4.23
Other miscellaneous uses: Waste material	(3/)	(3/)	2.76
Unspecified: 4/			
Actual	813	6,880	8.46
Estimated	392	3,030	7.72
Total or average	1,210	9,910	8.22
Grand total or average	6,320	34,000	5.38

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, miscellaneous stone, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEVADA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 2/	W	W	W	W
Coarse aggregate, graded 3/	W	W	W	W
Fine aggregate (-3/8 inch) 4/	W	W	W	W
Coarse and fine aggregate 5/	W	W	W	W
Other construction materials	1,080	4,600	1,180	7,530
Agricultural 6/	(7/)	(7/)	(7/)	(7/)
Chemical and metallurgical 8/	(7/)	(7/)	(7/)	(7/)
Special 9/	--	--	(7/)	(7/)
Unspecified: 10/				
Actual	259	2,000	553	4,880
Estimated	--	--	392	3,030
Total	2,050	11,400	4,270	22,700

W Withheld to avoid disclosing company proprietary data; included in "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface treatment aggregate, and other graded coarse aggregate.

4/ Includes screening (undesignated), stone sand (concrete), stone sand (bituminous mix or seal), and other fine aggregate.

5/ Includes graded road base or subbase and unpaved road surfacing.

6/ Includes agricultural limestone and other agricultural uses.

7/ Withheld to avoid disclosing company proprietary data; included in "Total."

8/ Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

9/ Includes mine dusting or acid water treatment and waste material.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregates and concrete products 2/	2,280	$11,800	$5.18
Asphaltic concrete aggregates and other bituminous mixtures	1,580	8,810	5.58
Road base and coverings 3/	3,890	14,800	3.81
Fill	1,040	4,140	3.97
Snow and ice control	42	179	4.26
Other miscellaneous uses	465	1,670	3.58
Unspecified: 4/			
Actual	13,500	55,400	4.09
Estimated	3,550	17,100	4.82
Total or average	26,400	114,000	4.32

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
NEVADA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts 2/	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	1,310	6,960	966	4,830	--	--
Asphaltic concrete aggregates and road base materials 4/	2,220	12,200	3,240	11,500	--	--
Fill	829	3,620	211	515	--	--
Other miscellaneous uses 5/	6	39	500	1,810	--	--
Unspecified: 6/						
Actual	62	102	9,030	47,900	4,460	7,370
Estimated	1,480	5,560	2,070	11,600	--	--
Total	5,910	28,400	16,000	78,100	4,460	7,370

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes production within the State with no district reported.

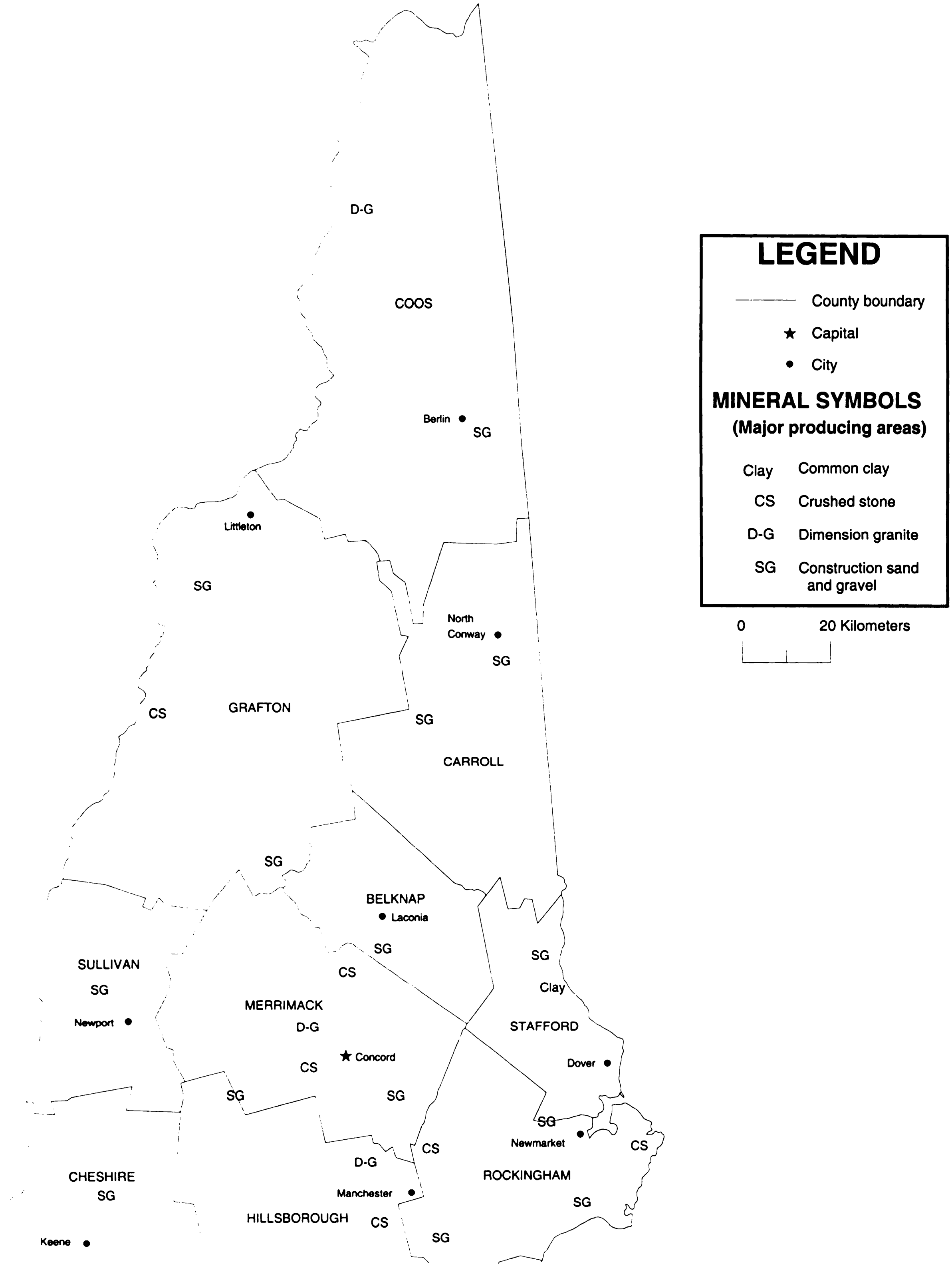
3/ Includes plaster and gunite sands.

4/ Includes road and other stabilization (cement).

5/ Includes snow and ice control.

6/ Reported and estimated production without a breakdown by end use.

NEW HAMPSHIRE



Source: New Hampshire Department of Environmental Services/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEW HAMPSHIRE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Hampshire Department of Environmental Services for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for New Hampshire was about $64 million, according to the U.S. Geological Survey (USGS). This was a 6% decrease from that of 1998[2] and followed a 38% increase from 1997 to 1998. Because data for crushed limestone, sandstone, and dimension granite have been withheld to protect company proprietary data, the actual total values for 1997-99 are higher than (while following the same trend as) those reported in table 1.

Construction sand and gravel, a high-volume, low-value mineral commodity, was New Hampshire's leading nonfuel mineral commodity, accounting for about 59% of its apparent nonfuel mineral value. Crushed stone was the State's second leading nonfuel mineral. In 1999, the decreased values of these two mineral commodities accounted for virtually all of New Hampshire's decrease in value. In 1998, crushed stone led the State's mineral commodities with more than a $15 million increase; construction sand and gravel also increased, up $3.6 million, while dimension granite showed a smaller decrease in value.

A variety of geologic maps, as well as publications related to New Hampshire's nonfuel mineral resources and markets, are available for purchase from the State government. Two geologic maps of New Hampshire are available over the Internet: *Generalized Bedrock Geologic Map of New Hampshire* and *Simplified Bedrock Geologic Map of New Hampshire*. These maps were adapted from the full-size original 1997 edition of *Bedrock Geology Map of New Hampshire*, Geologic Map GEO-1, which was produced as a joint project and in cooperation with the USGS. New Hampshire mineral publications that are available are as follows: *Construction Aggregate Resources of New England: An Analysis of Supply and Demand: Boston, MA*, New England Governors' Conference, Inc., 1995 (both full report and executive summary); *New Hampshire Sand and Gravel Resources: Boston, MA*, New England Governors' Conference, Inc., 1993, including three map sheets, scale 1:250,000; *Construction Aggregate Demand in the New England States: Boston, MA*, New England Governors' Conference, Inc., 1992; and *Bibliography and Index of New Hampshire Geology* (selected from publications indexed in GeoRef data base by American Geologic Institute), New Hampshire Department of Environmental Services, Geological Survey, 1991. Additionally, a series of peat resource maps is available.

Information regarding the cost and ordering procedures for any of the aforementioned publications may be obtained through the Office of the State Geologist or over the Internet at URL http://www.des.state.nh.us/geo1link.htm.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW HAMPSHIRE 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	6	NA	6	NA	6
Sand and gravel: Construction	8,440	36,400	8,590	40,000	7,920	37,600
Stone: Crushed 3/	2,000 r/	12,500 r/	4,190	27,500	3,850	26,000
Total 4/	XX	48,900 r/	XX	67,600	XX	63,600

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Excludes certain stones; values that must be concealed to avoid disclosing company proprietary data.
4/ Partial total, excludes values of stone (crushed sandstone and dimension granite) that must be concealed to avoid disclosing company proprietary data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Granite	6 r/	W	W	W	6	2,400	$15,100	$6.31
Sandstone	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Traprock	7 r/	W	W	W	7	1,800	12,500	6.93
Total or average	XX	2,000 r/	$12,500 r/	6.25 r/	XX	4,190	27,500	6.58

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
NEW HAMPSHIRE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/ 3/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$8.33
Riprap and jetty stone	W	W	6.36
Other coarse aggregate	202	$1,520	7.53
Coarse aggregates graded:			
Concrete aggregate, coarse	W	W	8.44
Other graded coarse aggregate	2,020	13,900	6.27
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	7.99
Other fine aggregate	567	3,980	7.03
Coarse and fine aggregates: Other coarse and fine aggregates	(4/)	(4/)	3.84
Unspecified: 5/			
Actual	(4/)	(4/)	6.09
Estimated	158	871	5.51
Total or average	4,190	27,500	6.58

W Withheld to avoid disclosing company proprietary data; included in "Other" category.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite and traprock; excludes sandstone from total to avoid disclosing company proprietary data.

3/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEW HAMPSHIRE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 3/	2,340	$14,700	$6.29
Asphaltic concrete aggregates and other bituminous mixtures	474	2,270	4.78
Road base and coverings	1,350	5,290	3.92
Fill	1,010	2,850	2.83
Snow and ice control	93	434	4.67
Other miscellaneous uses 4/	109	703	6.45
Unspecified: 5/			
Actual	1,650	6,420	3.90
Estimated	1,570	7,370	4.69
Total or average	8,590	40,000	4.66

1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

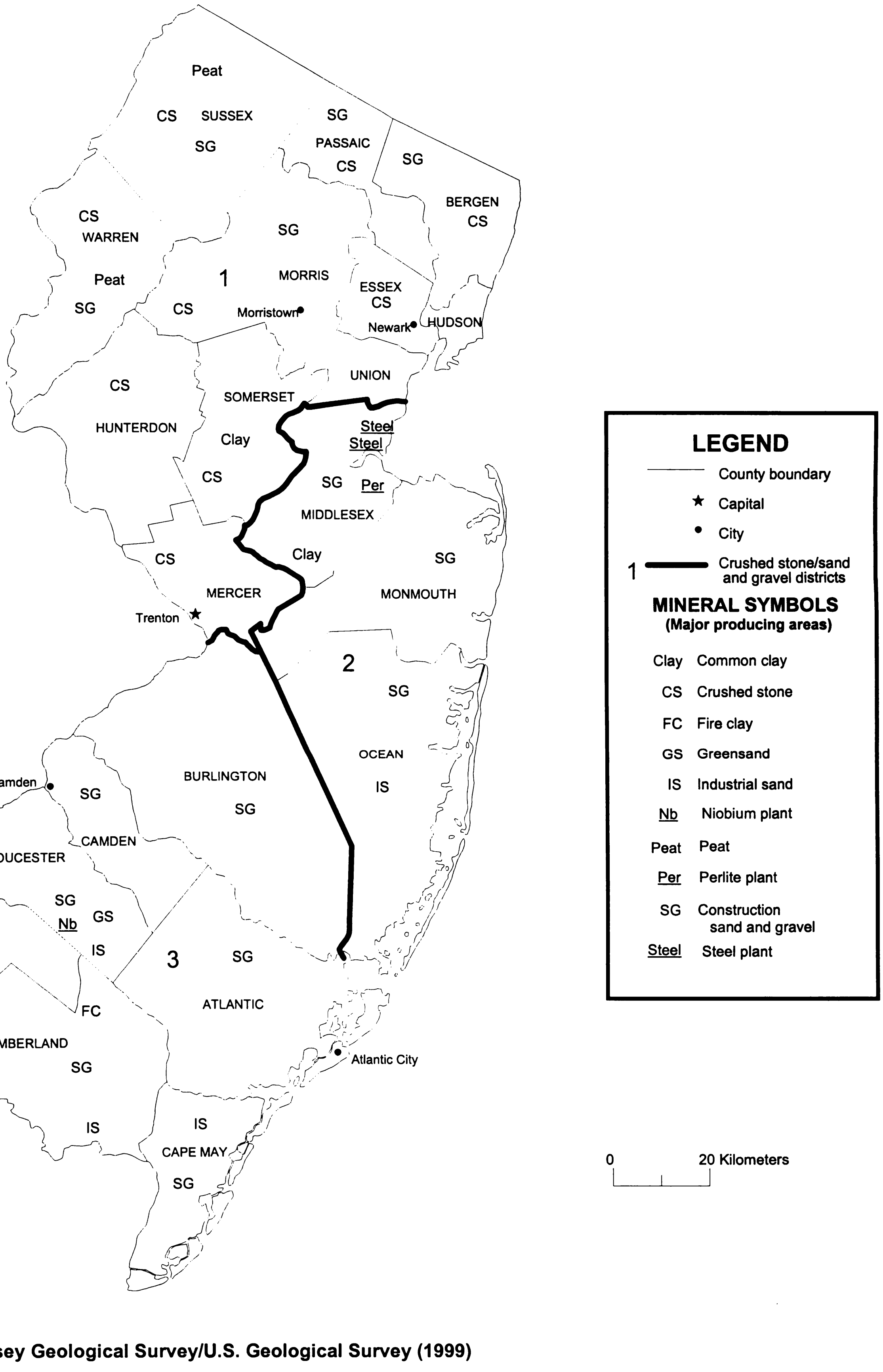
2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes filtration and railroad ballast.

5/ Reported and estimated production without a breakdown by end use.

NEW JERSEY



Source: New Jersey Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEW JERSEY

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Jersey Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for New Jersey was $300 million, according to the U.S. Geological Survey (USGS). This was a more than 3% increase from that of 1998[2] and followed an 8.6% increase from 1997 to 1998.

Crushed stone and construction sand and gravel, by value, were New Jersey's leading nonfuel mineral commodities. In 1999, the two commodities increased in value by about $8 million and $2 million, respectively, accounting for most of the State's increase in value. Only peat showed a decrease (small) in value and gemstones and common clay values were unchanged. In 1998, an $8 million increase in value for crushed stone led the State's rise in value; industrial and construction sand and gravel increased by about $6 million each.

Based upon USGS estimates of the quantities of minerals produced in the United States in 1999, New Jersey remained third among the States in industrial sand and gravel, having risen from seventh in 1997. The State continued to be the significantly larger producer of two States that produce greensand marl. Greensand is used directly as an organic conditioner and fertilizer for soils and as a water filtration medium to remove soluble iron and manganese from well water. Additionally, significant quantities of construction sand and gravel and crushed stone were produced in the State.

The following narrative information was provided by the New Jersey Geological Survey[3] (NJGS). Most New Jersey mining and exploration activities continue to be limited to sand and gravel, industrial sand, and crushed stone. Some clay, greensand, and peat mining takes place, but is of relatively minor importance. No new land-based mining operations of any significance started up during 1999.

Various large-scale capital projects in 1999 contributed to a healthy construction sector in the State. Major road-widening and realignment projects took place around the State, including work in Atlantic City on major road improvements.

Work on the 4-kilometer (km), $330 million Atlantic City/Brigantine Connector Tunnel and Roadway Project began during the year. When completed in 2001, the connector will have 11 bridges and a 640-meter (m) tunnel moving traffic through a residential area, under US Route 30 and into the Marina District. The roadway will link the Atlantic City Expressway with the city's Marina District. This project alone requires 612,000 cubic meters (m^3) of specified structural fill (sand and gravel containing minimal amounts of fines), 22,000 m of permanent pilings, 87,000 m^3 of structural concrete, 67,000 metric tons (t) of asphalt pavement, 960 t of bridge structural steel, 7,700 t of reinforcing steel, 6,100 m of reinforced concrete pipe, and 7,570 m of permanent concrete barrier rail.

In the Marina District of Atlantic City, the Mirage Resorts, Inc. project began the placement of 1.4 million cubic meters of fill material, which will be needed for the construction of a new casino and hotel at the site.

The Route 29 tunnel project in the State capital of Trenton is another project begun during the year, which will require 57,375 m^3 of concrete over 30 months.

Mergers and takeover activity during the year included the Tilcon NY/NJ, Inc. purchase of Millington Quarry, Inc. and Affiliates. Tilcon previously owned a single quarry in Prospect Park, Passaic County, from which it produced crushed rock. With this acquisition, Tilcon becomes the largest aggregate producer in New Jersey. The other big acquisition of the year was U.S. Silica Co.'s purchase of some of Unimin Corp.'s properties in New Jersey. This increases U.S. Silica's silica sand and construction sand holdings ten-fold in New Jersey.

Other items of interest include the New Jersey Department of Transportation approval of the importation of foreign cement and its establishment of uniform quality controls of aggregate products, which will take effect in January 2000.

Sand and gravel exploration and development remains the most active area of interest in the State. Offshore exploration and development of sand and gravel resources remains a topic of much interest. The U.S. Department of the Interior, Minerals Management Service, has proposed its first sand and gravel sale from an approximately 28,000-hectare site, 5 to 19 km off the New Jersey coast in Federal waters of the Atlantic Ocean. The site is located east of Monmouth County, from slightly north of Long Branch and slightly south of Belmar. Public hearings were continuing at the end of the year, with no decision expected until sometime in 2000 at the earliest.

The U.S. Army Corps of Engineers and the New Jersey Department of Environmental Protection are committed to long-term beach replenishment projects along the Atlantic Coast. The NJGS in cooperation with the U.S. Department of the Interior, Minerals Management Service, is continuing to locate and document offshore sand and heavy mineral occurrences.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Lloyd Mullikin, Supervising Geologist with the New Jersey Geological Survey, authored the text of New Jersey mineral industry information submitted by that agency.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW JERSEY 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	W	131	W	W	W	W
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	16,100	85,300	16,600	90,800	16,600	92,800
Industrial	1,530	28,300	1,800	34,400	1,840	34,500
Stone: Crushed	22,800	153,000	23,900	161,000	24,400	169,000
Combined values of other industrial minerals	XX	(3/)	XX	3,080	XX	2,910
Total	XX	267,000 4/	XX	290,000	XX	300,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with " Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Value excluded to avoid disclosing company proprietary data.

4/ Partial total, excludes values of greensand and peat that must be concealed to avoid disclosing company proprietary data.

TABLE 2
NEW JERSEY: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	5 r/	W	W	$10.4	4	1,110	$7,670	$6.90
Granite	8 r/	8,990 r/	$68,400 r/	7.60	11	9,830	62,800	6.38
Sandstone	1	W	W	5.43	1	W	W	6.11
Traprock	10	11,700	67,600	5.78	10	12,200	86,600	7.09
Miscellaneous stone	1	W	W	11.74	1	W	W	6.43
Total or average	XX	22,800	153,000	6.71	XX	23,900	161,000	6.77

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	95	$537	$5.65
Filter stone	27	325	12.04
Other coarse aggregate	1,020	6,060	5.92
Coarse aggregate, graded:			
Concrete aggregate, coarse	622	5,310	8.54
Bituminous aggregate, coarse	880	6,000	6.82
Bituminous surface-treatment aggregate	73	560	7.67
Railroad ballast	W	W	W
Other graded coarse aggregate	7,040	45,500	6.47
Fine aggregate (-3/8 inch):			
Stone sand, concrete	133	804	6.05
Stone sand, bituminous mix or seal	1,020	8,730	8.58
Screening, undesignated	1,100	7,520	6.86
Other fine aggregate	636	3,660	5.75
Coarse and fine aggregates:			
Graded road base or subbase	544	2,700	4.96
Terrazzo and exposed aggregate	7	188	26.86
Crusher run or fill or waste	518	2,660	5.14
Other coarse and fine aggregates	4,800	33,200	6.91
Agricultural:			
Agricultural limestone	72	1,070	14.86
Poultry grit and mineral food	9	200	22.22
Chemical and metallurgical:			
Lime manufacture	2	10	5.00
Chemical stone	6	105	17.50
Special:			
Whiting or whiting substitute	91	1,250	13.74
Roofing granules	236	5,140	21.79
Unspecified: 3/			
Actual	W	W	W
Estimated	4,700	28,500	6.05
Total or average	23,900	161,000	6.77

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, sandstone, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEW JERSEY: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	Districts 1 and 3	
Use	Quantity	Value
Construction aggregates:		
Coarse aggregate (+1 1/2 inch) 3/	1,150	6,920
Coarse aggregate, graded 4/	8,790	58,500
Fine aggregate (-3/8 inch) 5/	2,880	20,700
Coarse and fine aggregate 6/	6,100	43,800
Other construction materials	W	W
Agricultural 7/	81	1,270
Chemical and metallurgical 8/	8	115
Special 9/	91	1,250
Unspecified: 10/		
Actual	W	W
Estimated	4,700	28,500
Total	23,900	161,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported for District 2; District 3 included with District 1 to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded roadbase or subbase, terrazzo and exposed aggregate, crusher run (select or material use), and other coarse and fine aggregates.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Includes lime manufacture and chemical stone or alkali works.

9/ Includes whiting or whiting substitute and roofing granules.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	5,800	$31,900	$5.50
Plaster and gunite sands	391	2,170	5.55
Concrete products (blocks, bricks, pipe, decorative, etc.)	151	940	6.23
Asphaltic concrete aggregates and other bituminous mixtures	1,920	12,200	6.33
Road base and coverings	291	1,830	6.29
Fill	728	1,910	2.62
Snow and ice control	103	644	6.25
Other miscellaneous uses 2/	165	1,140	6.64
Unspecified: 3/			
Actual	4,080	23,400	5.72
Estimated	2,920	14,700	5.03
Total or average	16,600	90,800	5.48

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filtration.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
NEW JERSEY: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	643	5,440	2,760	15,100	2,940	14,500
Asphaltic concrete aggregates and other bituminous mixtures	107	1,110	1,660	10,400	158	668
Snow and ice control	155	987	21	205	115	639
Road base and coverings	78	518	W	W	W	W
Other miscellaneous uses 3/	439	1,770	224	581	256	814
Unspecified: 4/						
Actual	--	--	1,910	11,300	2,180	12,100
Estimated	1,930	10,200	122	883	870	3,570
Total	3,350	20,100	6,690	38,400	6,520	32,300

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses." -- Zero.

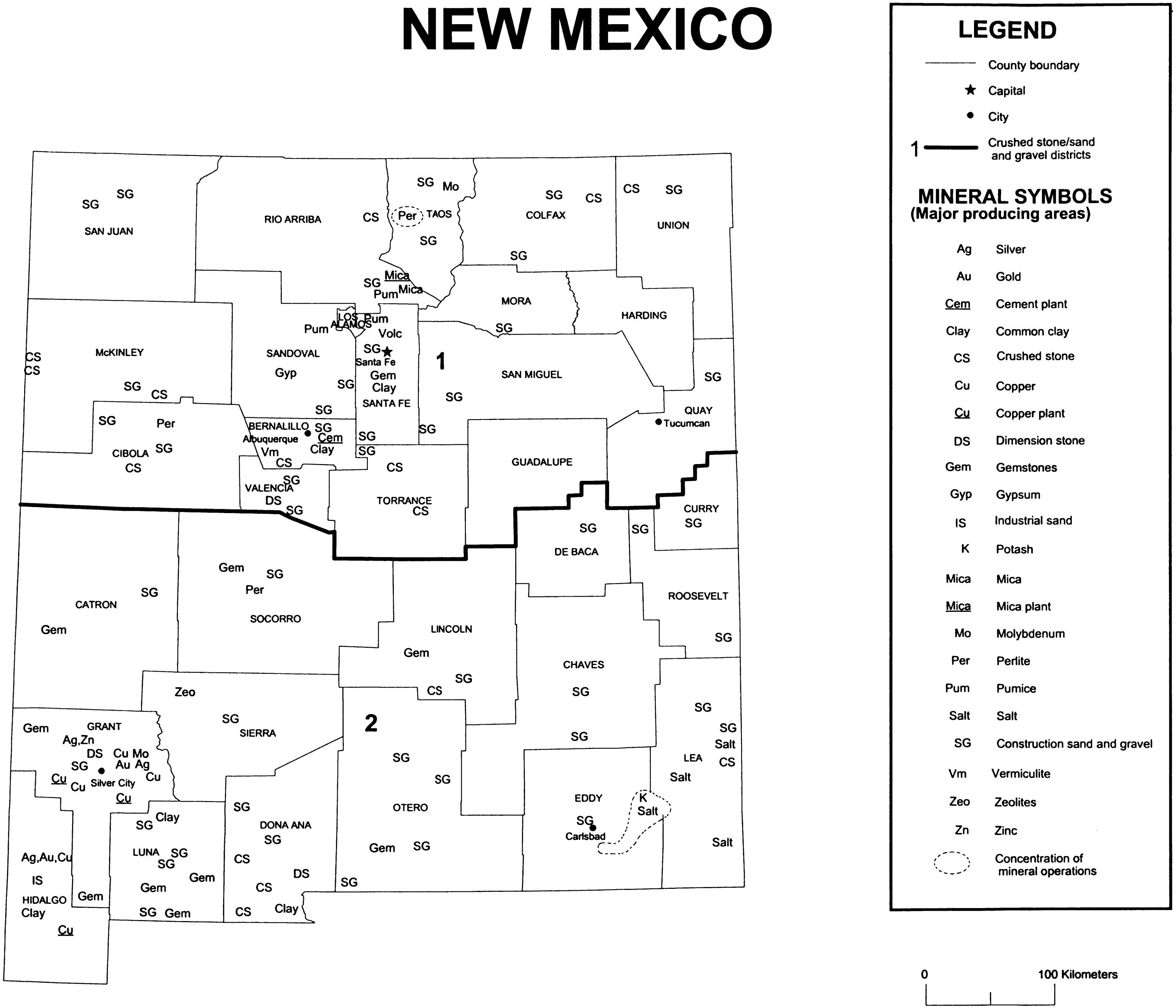
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill and filtration.

4/ Reported and estimated production without a breakdown by end use.

NEW MEXICO



Source: New Mexico Bureau of Mines and Mineral Resources/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEW MEXICO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Mines and Mineral Resources for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for New Mexico was $671 million, according to the U.S. Geological Survey (USGS). This was a 21% decrease from that of 1998[2] compared with the 18% decrease from 1997 to 1998. The State was 21st in rank (18th in 1998) among the 50 States in total nonfuel mineral production value and accounted for nearly 2% of the U.S. total.

The top nonfuel minerals in New Mexico were, by value, copper and potash and were followed by construction sand and gravel and portland cement. These four accounted for about 89% of the State's total nonfuel mineral production value. In 1999, the combined decrease in the values of copper, potash, and molybdenum (listings are by descending magnitude of change) was $169 million and accounted for a large majority of the State's drop in value. Construction sand and gravel, crushed stone, and gold had smaller, but significant decreases in value. Relatively small increases occurred in the values of gemstones, iron ore, perlite, portland cement, and pumice and pumicite. In 1998, most of the State's drop in nonfuel mineral value resulted from the decreased values of copper (down $174 million) and potash (down about $12 million). Decreases in dimension stone and molybdenum were smaller, but significant. The largest increases for the year included those of construction sand and gravel (up $6.7 million), crushed stone (up $5.3 million), and crude gypsum (up about $1.3 million) (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 1999, New Mexico was first in the Nation in potash, perlite, and zeolites; third in copper, mica, and pumice and pumicite; sixth in molybdenum; and eighth in gypsum and silver (production listings by descending order of value).

The following narrative information was provided by the New Mexico Bureau of Mines and Mineral Resources.[3] The continuing drop in metals prices in 1999 resulted in layoffs, mine closures, and cutbacks. Copper prices fell in response to increased inventories worldwide. The COMEX spot prices averaged $1.35 per pound in 1995, $1.06 per pound in 1996, $1.04 per pound in 1997, $0.75 per pound in 1998, and $0.72 per pound in 1999.

The largest porphyry copper deposit in New Mexico was the Chino Mine at Santa Rita, where copper sulfides occur in the upper fractured granodiorite and adjacent sedimentary rocks. In 1999, Phelps Dodge Corp. produced 67,400 metric tons (t) of copper in concentrates and precipitates and 50,600 t of copper by solvent extraction-electrowinning (SX-EW). Estimated milling reserves in 1999 were 301.4 million metric tons (Mt) of 0.62% copper, and estimated leaching reserves were 427.6 Mt of 0.3% copper. Phelps Dodge Corp. owned 66.7% of the reserves at Chino (Phelps Dodge Corp., 2000, p. 68).

The Tyrone porphyry copper deposit in the Burro Mountains occurs within a quartz-monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, which sometimes are considered to be separate porphyry copper deposits, have been found. In 1999, leaching reserves (recoverable copper) have been estimated to be 452.3 Mt of ore grading 0.3% copper. Copper production by SX-EW in 1999 was 72,700 t of copper, compared with 74,900 t in 1998 (Phelps Dodge Corp., 2000, p. 68).

On February 3, 1998, Phelps Dodge acquired Cobre Mining Co., Inc., for approximately $115 million. The primary assets included the Continental Mine, which comprised an open pit mine, two underground mines, two mills, and 4,500 hectares (ha) of surrounding land. On October 21, 1998, Phelps Dodge suspended underground mining at Cobre owing to low copper prices. On March 17, 1999, the remaining operations were suspended. The entire operation remained on care-and-maintenance status through the rest of the year. Estimated milling reserves in 1999 were 120.1 Mt of 0.73% copper, and estimated leaching reserves were 88.8 Mt of 0.35% copper. Copper production in 1999 amounted to 6,000 t of copper (Phelps Dodge Corp., 2000, p. 68).

As part of its plan to lower costs, which included curtailing concentrate production at its Morenci Mine in Arizona, Phelps Dodge temporarily closed the Hidalgo smelter south of Lordsburg, NM, on September 3. With its successful acquisition of Cyprus Amax Minerals Co. during the fourth quarter, Phelps Dodge announced a write-down of the smelter and its intent to reconfigure it to produce sulfuric acid. Its Hidalgo, NM, smelter continued to operate (Phelps Dodge Corp., 2000, p. 9).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Virginia T. McLemore, Senior Economic Geologist, authored the information submitted by the New Mexico Bureau of Mines and Mineral Resources.

Environmental impact statements (EIS) were being prepared by Phelps Dodge for expansions at the Chino, the Continental, and the Santa Rita Mines. In voluntary cooperation with the New Mexico Environmental Department, Phelps Dodge was also beginning reclamation at six sites in the Silver City area that have been affected by historic mining: Hanover Creek, the town of Hurley, the Hurley smelter, the tailings area south of the smelter, the Lampbright area, and Whitewater Creek. The first stage will be to develop a background report defining the problems. Successive stages will involve remedial investigations, a feasibility study, and remedial action.

The Copper Flat deposit in Sierra County, which was discovered in 1975, consists of copper, gold, molybdenum, and silver disseminated in a quartz-monzonite stock and quartz veins. Unlike the Santa Rita and the Tyrone deposits, Copper Flat has no major supergene enrichment zone; rather it is a high-grade hypogene deposit with relatively low pyrite. Quintana Minerals Corp., prior to closure of the mine, produced approximately 3,400 t of copper (Cu), 72 kilograms (kg) of gold (Au), and 1,741 kg of silver (Ag) from March through June 1982. The Copper Flat deposit has proven and probable reserves of 45.5 Mt of ore at an average grade of 0.45% Cu, 0.14 gram per metric ton (g/t) Au, 2.3 g/t Ag, and 0.015% molybdenum (Mo) as of December 31, 1998. Contained metal is approximately 203,000 t Cu, 7 t Au, 103 t Ag, and 6,700 t Mo. The deposit has internal continuity and an estimated stripping ratio of less than 0.9:1. On March 8, 2000, Alta Gold Co., which is the current owner of the Copper Flat property, filed for protection with the United States Bankruptcy Court in Reno, NV. Since April 14, 1999, Alta Gold had been operating as a debtor in possession, pursuant to a voluntarily filed petition to reorganize under Chapter 11 of the Bankruptcy Code, in an attempt to reorganize the business and to restructure its debt and other liabilities. Alta Gold's remaining assets will probably be liquidated under the direction of the bankruptcy court or in some similar forum.

Molycorp Inc.'s Questa molybdenum underground mine closed in 1992 because of falling molybdenum prices and reopened in 1996; Molycorp was a subsidiary of Unocal Corp. The mine has been operated sporadically since the 1920's, and Unocal Corp. began mining at Questa in the 1980's. Current (1999) grade was estimated to be 0.3% to 0.5% Mo. Estimated production for 1999 was 4,500 t of molybdenite. Approximately 150 people worked at the mine in 1999. Molybdenum is used to manufacture various metal products, especially steel, and as lubricants. The company also continued with a reclamation and revegetation program to cover overburden dumps at the inactive open pit mine site. A proposed expansion plan was announced in September 1998 that would mine an estimated 32,000 t of ore reserves. As a result of a drop in molybdenum prices at the end of 1998, however, Molycorp announced that it would curtail production at the Questa Mine. In November 1999, the U.S. Environmental Protection Agency announced that it would like to list the Questa Mine as a superfund site; a final decision is pending input from the State of New Mexico.

St. Cloud Mining Co., which was a subsidiary of The Goldfield Corp., has operated a zeolite open pit mine in Sierra County since 1990. The mining properties consisted of approximately 600 ha and contained several hundred million tons of reserves. Zeolites are altered volcanic ash, and clinoptilolite is the predominant mineral. Clinoptilolite is mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. Markets include cat litter, industrial fillers and absorbents, filtration media, environmental products, animal feed supplements, and soil conditioners. In 1999, St. Cloud produced 14,431 t of natural zeolite compared with 12,787 t in 1998, 13,620 t in 1997, and 13,114 t in 1996. St. Cloud also has made several modifications to its zeolite operation, such as the addition of cation exchange capacity for added value products and additional classification capabilities to expand markets for its products.

St. Cloud owned claims in the Chloride mining district in Sierra County where indicated reserves have been estimated to be 317,000 t at an average grade of 0.70% Cu, 204 g/t Ag, and 1.06 g/t Au. The property, which had been mined from 1981 through early 1992, remained inactive in 1999.

St. Cloud also owned claims in the Lordsburg mining district in Hidalgo County where indicated reserves were estimated to be 94,200 t at an average grade of 0.53% Cu, 34 g/t Ag, and 3.3 g/t Au. The company produced and sold 4,674 t of construction aggregate material in 1999 compared with 15,011 t in 1998; 22,274 t in 1997; and 12,764 t in 1996.

Copar Pumice Co.'s expansion of El Cajete pumice mine in the Jemez Mountains was delayed until preparation of an EIS (draft released early 1997). The mine opened in 1997 and will operate for 10 years. Reserves were estimated to be 90,000 t of pumice that will be used in making stonewashed jeans. Other pumice mines were active in the region.

The Carlsbad potash district is the largest potash-producing area in the United States. Mississippi Potash, Inc., which was a subsidiary of Mississippi Chemical Corp., and IMC Kalium Potash Mines, which was a subsidiary of IMC Global Inc., operated mines in the district. Langbeinite and sylvite are the primary potash minerals found in Permian evaporates of the Permian Basin. Mining is by underground methods. Sodium salt is also produced locally. Potash is used mainly in fertilizers.

In 1999, IMC Kalium completed construction and began construction at its new $77 million langbeinite refinery. Production was discontinued at Western Ag Mineral's Mine during 1999, which was acquired by IMC Kalium in 1997. Western Ag Minerals had an annual capacity of 360,000 t of potash ore. During 1999, the underground mine was connected to IMC Kalium's Carlsbad Mine with the ore directed to the new refinery. The total reserves at IMC Kalium mines included an estimated total of 202.6 Mt of potash ore in four mining beds at thicknesses that range from 1.4 meters (m) to more than 3.4 m. These ore reserves were estimated to yield 14.5 Mt of concentrate from sylvinite with an average grade of 60% K_2O and 37.3 Mt of langbeinite concentrate with an average grade of approximately 22% K_2O. Total production in 1999 was more than 1.5 Mt of finished product.

In 1999, Mississippi Potash, Inc. (formerly New Mexico Potash Corp. and Eddy Potash Inc.), completed an expansion of its Carlsbad facilities in 1999 at a cost of $6.4 million. There are two facilities at Carlsbad, the east and west mines. As of 1999, the estimated total reserves were 474 Mt with an average grade of 15.2% K_2O. The recoverable reserves were estimated to be 424 Mt at a grade of 14.5% K_2O. The production capacity was estimated to be 1Mt per year.

In early 1999, KMG Minerals Division of Franklin Industries, Inc., announced expansion plans for its MICA Mine in Taos County. Currently, the mine is the fourth largest scrap mica mine in the United States and covers approximately 6 ha. The expansion called for an increase to 36 ha within 20 years. The nearby Picuris Pueblo opposed any expansion of the mine. Oglebay Norton Co. acquired the mine in December 1999 from Franklin Industries. Mica is used as a filler in building materials and plastics for its unique physical characteristics, which include color, strength, flexibility, durability, thermal properties, and light weight. It is used in the manufacture of numerous industrial and consumer products, such as joint compound, paints, automotive sound-deadening materials, thermoplastics, coatings, and even cosmetics.

Improvement in the price of uranium led to the continued operation by Quivira Mining Co., which was a subsidiary of Rio Algom Ltd., (successor to Kerr McGee Corp.), of mine water recovery of uranium from waters recovered from inactive underground operations at Ambrosia Lake, Grants, NM. Approximately 113 t of U_3O_8 was produced from mine water recovery in 1999. Hydro Resources Inc. continued with plans to mine uranium by in situ leaching at Churchrock, and NZU Inc. also planned to mine by in situ leaching at Crownpoint. Rio Grande Resources Co. maintained the closed facilities at the Mount Taylor underground mine in Cibola County. In late 1997, Anaconda Uranium acquired the La Jara Mesa uranium deposit in Cibola County from Homestake Mining Co. The sandstone uranium deposit had been discovered in the late 1980's in the Morrison Formation and contained approximately 3,600 t of 0.25% U_3O_8.

Reference Cited

Phelps Dodge Corp., 2000, 1999 annual report: Phelps Dodge Corp., 75 p.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Clays:						
Common	32	168	33	173	34	171
Fire	1	17	1	17	1	17
Copper 3/	259	612,000	252	438,000	W	W
Gemstones	NA	W	NA	W	NA	13
Sand and gravel: Construction	9,390	46,600	11,100	53,300	9,600	46,800
Stone: Crushed 4/	2,920	15,700	4,940	21,000	3,650	15,900
Zeolites metric tons	(5/)	NA	(5/)	NA	NA	NA
Combined values of cement, gold, gypsum (crude), iron ore (usable), mica (crude), molybdenum, perlite (crude), potash, pumice and pumicite, salt, silver, stone [crushed sandstone and traprock (1998-99), crushed traprock (1997), dimension granite and marble (1997), dimension miscellaneous (1998-99)], and values indicated by symbol W	XX	363,000	XX	341,000 r/	XX	608,000
Total	XX	1,040,000	XX	853,000 r/	XX	671,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

4/ Excludes certain stones; value included with "Combined values" data.

5/ Withheld to avoid disclosing company proprietary data.

TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	22	1,220	$5,670	$4.63	25	2,200	$8,630	$3.93
Granite	4 r/	784 r/	5,840 r/	7.44 r/	2	W	W	3.52
Sandstone	--	--	--	--	1	(2/)	(2/)	(2/)
Traprock	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Volcanic cinder and scoria	5	275 r/	2,420	8.81 r/	10	W	W	9.75
Miscellaneous stone	6 r/	639 r/	1,730 r/	2.70 r/	22	980	4,350	4.43
Total or average	XX	2,920	15,700	5.36	XX	4,940	21,000	4.25

r/ Revised. W Withheld to avoid disclosing proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	67	$383	$5.72
Other coarse aggregate	6	28	4.67
Coarse aggregate, graded:			
Concrete aggregate, coarse	616	2,870	4.65
Bituminous aggregate, coarse	W	W	5.99
Bituminous surface-treatment aggregate	W	W	8.68
Railroad ballast	W	W	1.10
Other graded coarse aggregate	789	1,630	2.07
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	4.24
Screening, undesignated	W	W	4.49
Other fine aggregate	589	2,650	4.49
Coarse and fine aggregates:			
Graded road base or subbase	213	804	3.77
Terrazzo and exposed aggregate	55	243	4.41
Crusher run or fill or waste	43	178	4.14
Other construction materials	90	439	4.88
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	3.31
Flux stone	(4/)	(4/)	(4/)
Special: Roofing granules	(3/)	(3/)	5.77
Other miscellaneous uses: Other specified uses not listed	(3/)	(3/)	22.28
Unspecified: 5/			
Actual	760	3,350	4.41
Estimated	972	4,290	4.41
Total	4,940	21,000	4.25

W Withheld to avoid disclosing company proprietary data; included with "Other".

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, and volcanic cinder and scoria; excludes sandstone and traprock from total to avoid disclosing company proprietary data.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Excluded from total to avoid disclosing company proprietary data.

5/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	--	--
Coarse aggregate, graded 4/	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 5/	W	W	W	W	--	--
Coarse and fine aggregate 6/	304	1,250	43	178	--	--
Other construction materials	1,990	7,270	166	722	--	--
Chemical and metallurgical 7/	(8/)	(8/)	(9/)	(9/)	--	--
Special 10/	(8/)	(8/)	--	--	--	--
Other miscellaneous uses	(8/)	(8/)	--	--	--	--
Unspecified: 11/						
Actual	15	67	10	43	734	3,240
Estimated	158	696	814	3,590	--	--
Total	3,180	13,200	1,030	4,530	734	3,240

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite, limestone, miscellaneous stone, and volcanic cinder and scoria; excludes sandstone and traprock from total to avoid disclosing company proprietary data.

3/ Includes riprap and jetty stone and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo, and exposed aggregate.

7/ Includes cement manufacture and flux stone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Excluded from total to avoid disclosing company proprietary data.

10/ Includes roofing granules.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	2,080	$8,670	$4.17
Plaster and gunite sands	137	712	5.20
Asphaltic concrete aggregates and other bituminous mixtures	1,280	6,660	5.22
Road base and coverings 2/	989	4,350	4.40
Fill	503	2,080	4.14
Other miscellaneous uses 3/	110	467	4.25
Unspecified: 4/			
Actual	1,430	6,590	4.61
Estimated	4,620	23,800	5.15
Total or average	11,100	53,300	4.78

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilizations (lime).

3/ Includes railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		Unspecified districts 2/	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	1,610	5,940	472	2,730	--	--
Plaster and gunite sands	103	528	34	185	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,230	6,450	50	208	--	--
Road base and coverings	581	2,610	408	1,740	--	--
Other miscellaneous uses 3/	383	1,740	230	808	--	--
Unspecified 4/	3,560	17,400	2,240	12,600	248	411
Total	7,460	34,700	3,440	18,200	248	411

-- Zero.

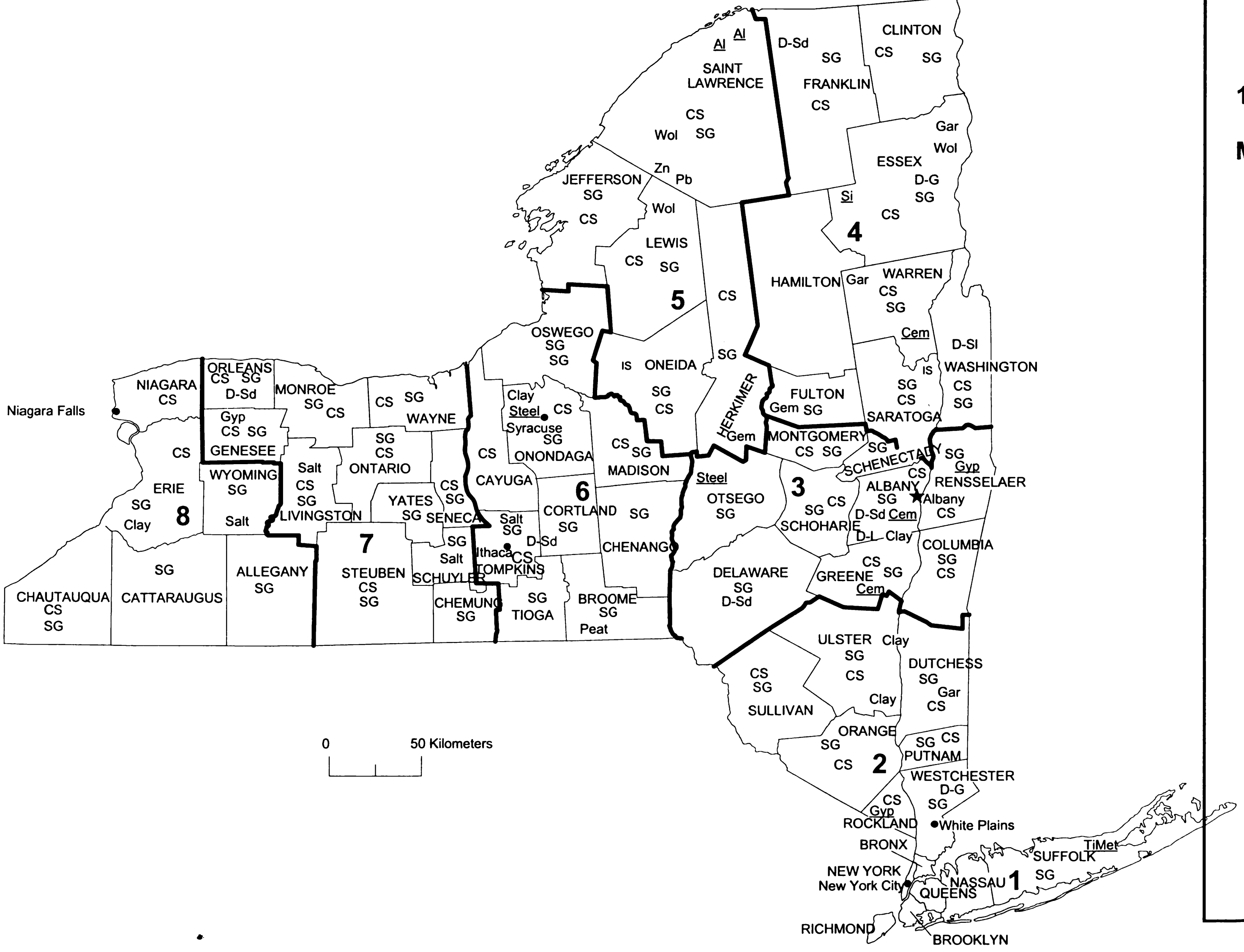
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes production within the State with no district reported.

3/ Includes fill and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

NEW YORK



LEGEND

—	County boundary
★	Capital
●	City
1—	Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Cem	Cement plant
Clay	Clay
CS	Crushed stone
D-G	Dimension granite
D-L	Dimension limestone
D-Sd	Dimension sandstone
D-Sl	Dimension slate
Gar	Garnet
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
Pb	Lead
Peat	Peat
Salt	Salt
SG	Construction sand and gravel
Si	Silcon metal plant
Steel	Steel plant
TiMet	Titanium metal plant
Wol	Wollastonite
Zn	Zinc

Source: New York State Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NEW YORK

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New York State Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for New York was $987 million, according to the U.S. Geological Survey (USGS). This was about a 2% increase from that of 1998,[2] and followed a 1.8% increase from 1997 to 1998. New York rose in rank to 15th from 16th in the Nation in total nonfuel mineral production value, of which the State accounted for about 2.5 % of the U.S. total.

In 1999, crushed stone, by value, remained New York's leading nonfuel mineral, followed by salt, portland cement, construction sand and gravel, and zinc. These five mineral commodities accounted for about 91% of the State's total nonfuel mineral production value, of which industrial minerals and mineral products represented about 95%. Zinc accounted for the major portion of metal production and value.

The State's increase in value in 1999 resulted mostly from a $14 million rise in the value of crushed stone, an $11 million increase in salt, and a lesser yet significant increase in portland cement (table 1). Only the values of construction sand and gravel and zinc (listings are by descending magnitude of change) showed similarly significant decreases. In 1998, moderate to small decreases occurred in zinc, crushed stone, gypsum, and wollastonite values, but these were more than offset by increases in construction sand and gravel, salt, portland cement, and common clay, leading to New York's rise in value for the year. All other changes for both years were small relative to these and inconsequential to the net result.

Based on USGS estimates of the quantities produced in the 50 States in 1999, New York remained the only State to produce wollastonite, first of three industrial garnet-producing States, third in the production of salt, fourth in talc, sixth in dimension stone, and eighth in portland cement. The State increased in rank to fifth from sixth in lead, but dropped to fourth from third in the production of zinc. Additionally, New York mining and mineral processing operations produced substantial quantities of crushed stone, construction sand and gravel, common clay, and masonry cement (in descending order of value).

The following narrative information was provided by the New York State Geological Survey (NYSGS) and the Division of Mineral Resources[3] (DMR) of the New York State Department of Environmental Conservation. The DMR reported that 2,489 mines were active in New York in 1999. These mines affected about 19,400 hectares (ha). During the year, 233 ha were reclaimed for a total of 1,950 ha, or a little more than 10% of the area in the State then affected by mining. Of the total number of mines statewide, 1,839 were operated by industry and 650 by State, county, or town governments. The majority of mines (937) affected small parcels of land that were less than 2 ha in size; mines affecting 2 to 4 ha parcels were second most abundant (607). Mines affecting an area of more than 4 ha but less than 8 ha totaled 421, and mines affecting an area of more than 8 ha but less than 12 ha numbered 153. The total number of large mines, those that were larger than 12 ha, amounted to 290. Minor projects accounted for the rest of the total. During the year 502 mining permits were issued, of which 83 were for new mines. The aggregate value of reclamation financial security held by New York State in 1999 was about $72.6 million.

The DMR staff conducted a mining permit application seminar in Hancock, NY, to assist small-scale bluestone miners with compliance issues surrounding the requirements of the Mined Land Reclamation Law. Bluestone (most commonly) is a blue-green to blue-gray dimension stone quarried for paving stone and other architectural uses. It is a Devonian feldspathic quartzite currently produced in the southwest region of the Catskill Mountains, contiguous with the bluestone-producing regions of Pennsylvania. These quarries are, on average, less than 0.5 ha, and numerous. DMR initiatives brought more than 35 bluestone operations into regulatory compliance during 1999. Illegal bluestone operations and complaints surrounding these mines have been a problem to the Department for many years. Prior to the Division's initiative, only 13 bluestone mines had valid permits.

American Rock Salt, Inc., made significant progress in constructing its new underground salt mine in the town of Groveland, Livingston County. The two production shafts reached their final depth of about 400 meters, and commercial salt development began. The mine and company essentially are the successors to the Akzo-Nobel Salt Inc.'s rock salt mine at Retsof, NY. A roof failure at the Retsof Mine and the subsequent inundation of water from 1994 to 1996 resulted in the ultimate loss of the mine.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] William Kelly, Associate Scientist with the New York State Geological Survey (a bureau of the New York State Museum in the State Education Department), Division of Research and Collections, and Steven Potter, Mined Land Reclamation Specialist II with the New York State Department of Environmental Conservation, Division of Mineral Resources, coauthored the text of mineral industry information submitted by those agencies. Mr. Potter may be contacted at his State agency, 50 Wolf Rd, Albany, NY 12233, telephone: (518) 457-9341; fax: (518) 457-9298; the New York State Department of Environmental Conservation is on the Internet at http://www.dec.state.ny.us/website/dmn/.

Porter's Concrete Service, Waverley, NY, was awarded the 1999 New York State Mined Land Reclamation Award at the New York State Fair in Syracuse. The award to Porter Concrete was based on the owner's executed mine plan and his integration of business and personal goals with mine reclamation goals. About 45 ha of the 87 ha that were previously affected by mining have been fully reclaimed.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW YORK 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	477	12,100	622	16,100	625	15,700
Gemstones	NA	70	NA	64	NA	54
Salt	3,590	183,000	4,120	198,000	4,220	209,000
Sand and gravel: Construction	28,500	144,000	32,100	161,000	29,300	150,000
Stone:						
Crushed	44,400	285,000	47,200	279,000	48,300	293,000
Dimension metric tons	54,700	9,380	52,900	8,870	48,500	8,900
Combined values of cement, garnet (industrial), gypsum (crude), lead, peat, sand and gravel (industrial), silver, talc and pyrophyllite, wollastonite, zinc	XX	321,000	XX	309,000	XX	310,000
Total	XX	955,000	XX	972,000	XX	987,000

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NEW YORK: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	55	22,000	$119,000	$5.41	55	22,200	$128,000	$5.79
Dolomite	11 r/	7,630 r/	56,100 r/	7.36 r/	13	8,250	50,400	6.11
Limestone-dolomite	11	5,870	34,100	5.81	12	7,320	40,200	5.49
Granite	8	2,210	16,100	7.31	9	2,770	21,500	7.76
Marble	1	85	1,390	16.29	1	90	1,580	17.60
Sandstone 2/	8 r/	1,990 r/	11,700 r/	5.85 r/	10	1,550	11,300	7.29
Traprock	3 r/	W	W	W	3	3,830	18,100	4.73
Slate	1	W	W	W	--	--	--	--
Miscellaneous stone	3	1,020	5,010	4.91	3	1,200	7,340	6.11
Total or average	XX	44,400	285,000	6.43	XX	47,200	279,000	5.91

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. --Zero.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes sandstone-quartz to avoid disclosing company proprietary data.

TABLE 3
NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$10.72
Riprap and jetty stone	417	$3,180	7.63
Filter stone	253	1,450	5.73
Other coarse aggregate	210	2,000	9.51
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,680	10,000	5.95
Bituminous aggregate, coarse	5,600	37,700	6.73
Bituminous surface-treatment aggregate	674	4,530	6.72
Railroad ballast	118	603	5.11
Other graded coarse aggregate	2,150	19,400	9.03
Fine aggregate (-3/8 inch):			
Stone sand, concrete	80	436	5.46
Stone sand, bituminous mix or seal	1,040	6,570	6.31
Screening, undesignated	682	4,290	6.29
Other fine aggregate	709	4,720	6.66
Coarse and fine aggregates:			
Graded road base or subbase	4,740	28,600	6.04
Unpaved road surfacing	163	896	5.48
Terrazzo and exposed aggregate	227	1,270	5.59
Crusher run or fill or waste	3,200	16,600	5.19
Other coarse and fine aggregates 3/	5,660	30,100	5.33
Other construction materials	511	3,710	7.25
Agricultural:			
Agricultural limestone	W	W	9.59
Other agricultrual uses	205	1,890	9.21
Chemical and metallurgical:			
Cement manufacture	(4/)	(4/)	4.15
Lime manufacture	(4/)	(4/)	22.16
Special:			
Asphalt fillers or extenders	W	W	3.00
Other fillers or extenders	3	171	56.93
Roofing granules	W	W	3.33
Other special uses	23	75	3.26
Other miscellaneous uses	30	179	5.97
Unspecified: 5/			
Actual	7,650	42,500	5.56
Estimated	7,820	43,200	5.52
Total or average	47,200	279,000	5.91

W Withheld to avoid disclosing company proprietary data; included with "Other".

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone, sandstone-quartz, slate, and traprock.

3/ Includes drain fields.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Reported and estimated production without a breakdown by end use.

TABLE 4
NEW YORK: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 2		District 3		District 4		District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:														
Coarse aggregate (+1 1/2 inch) 3/	248	2,140	243	1,730	49	265	54	481	W	W	226	1,360	W	W
Coarse aggregate, graded 4/	3,200	26,600	2,040	14,500	1,130	6,590	949	7,840	W	W	1,650	8,950	W	W
Fine aggregate (-3/8 inch) 5/	789	5,850	551	3,200	232	1,590	W	W	211	1,230	522	2,630	W	W
Coarse and fine aggregate 6/	4,530	24,100	1,660	9,450	1,210	7,330	814	3,690	W	W	2,050	10,700	W	W
Other construction materials 7/	--	--	306	2,250	W	W	--	--	17	94	--	--	W	W
Agricultural 8/	W	W	27	103	W	W	W	W	W	W	W	W	W	W
Chemical and metallurgical 9/	--	--	W	W	W	W	47	1,040	--	--	--	--	--	--
Special 10/	--	--	--	--	--	--	W	W	--	--	W	W	--	--
Other miscellaneous uses	--	--	4	26	--	--	--	--	25	153	--	--	--	--
Unspecified: 11/														
Actual	717	3,950	W	W	W	W	W	W	2,670	15,000	1,980	10,900	--	--
Estimated	W	W	1,540	8,420	452	2,800	307	1,550	W	W	1,690	9,290	W	W
Total	12,400	78,900	9,220	52,700	4,090	22,800	4,100	25,700	4,910	26,800	8,180	44,200	4,240	27,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported in District 1.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

7/ Includes drain fields.

8/ Includes agricultural limestone and other agricultural uses.

9/ Includes cement and lime manufacture.

10/ Includes asphalt fillers or extenders, roofing granules, and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	6,580	$41,200	$6.25
Plaster and gunite sands	302	1,730	5.71
Concrete products (blocks, bricks, pipe, decorative, etc.)	193	1,540	7.97
Asphaltic concrete aggregates and other bituminous mixtures	2,270	12,700	5.61
Road base and coverings	4,370	19,700	4.50
Road and other stabilization (cement and lime)	71	313	4.41
Fill	2,030	5,430	2.67
Snow and ice control	1,370	5,180	3.79
Railroad ballast	104	674	6.48
Other miscellaneous uses	166	923	5.56
Unspecified: 2/			
Actual	4,120	21,900	5.33
Estimated	10,500	50,000	4.76
Total or average	32,100	161,000	5.03

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Reported and estimated production without a breakdown by end use.

TABLE 6
NEW YORK: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	1,320	8,430	620	5,810	703	3,470	323	1,460
Concrete products (concrete blocks, bricks, pipe, decorative, etc.) 2/	271	1,870	W	W	14	100	7	34
Asphaltic concrete and other bituminous mixtures	--	--	256	1,570	361	1,930	255	1,110
Roadbase and covering 3/	299	2,920	279	1,420	880	3,570	633	2,390
Fill	W	W	86	406	888	1,810	318	551
Snow and ice control	W	W	W	W	228	906	161	469
Other miscellaneous uses 4/	50	263	46	415	39	161	53	355
Unspecified 5/	1,410	8,160	960	5,360	1,120	5,680	1,500	5,460
Total	3,350	21,600	2,320	15,400	4,230	17,600	3,250	11,800

	District 5		District 6		District 7		District 8	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	159	819	1,160	6,850	1,180	7,610	1,120	6,710
Concrete products (concrete blocks, bricks, pipe, decorative, etc.) 2/	W	W	W	W	97	563	W	W
Asphaltic concrete and other bituminous mixtures	--	--	921	5,480	W	W	W	W
Roadbase and covering 3/	131	479	896	3,300	669	2,550	657	3,360
Fill	W	W	W	W	W	W	W	W
Snow and ice control	143	411	275	977	267	1,210	203	760
Other miscellaneous uses 4/	26	112	96	542	119	484	633	3,580
Unspecified 5/	1,250	6,380	1,210	5,540	2,930	14,900	4,240	20,500
Total	1,850	8,690	4,940	23,900	5,290	27,400	6,850	34,900

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

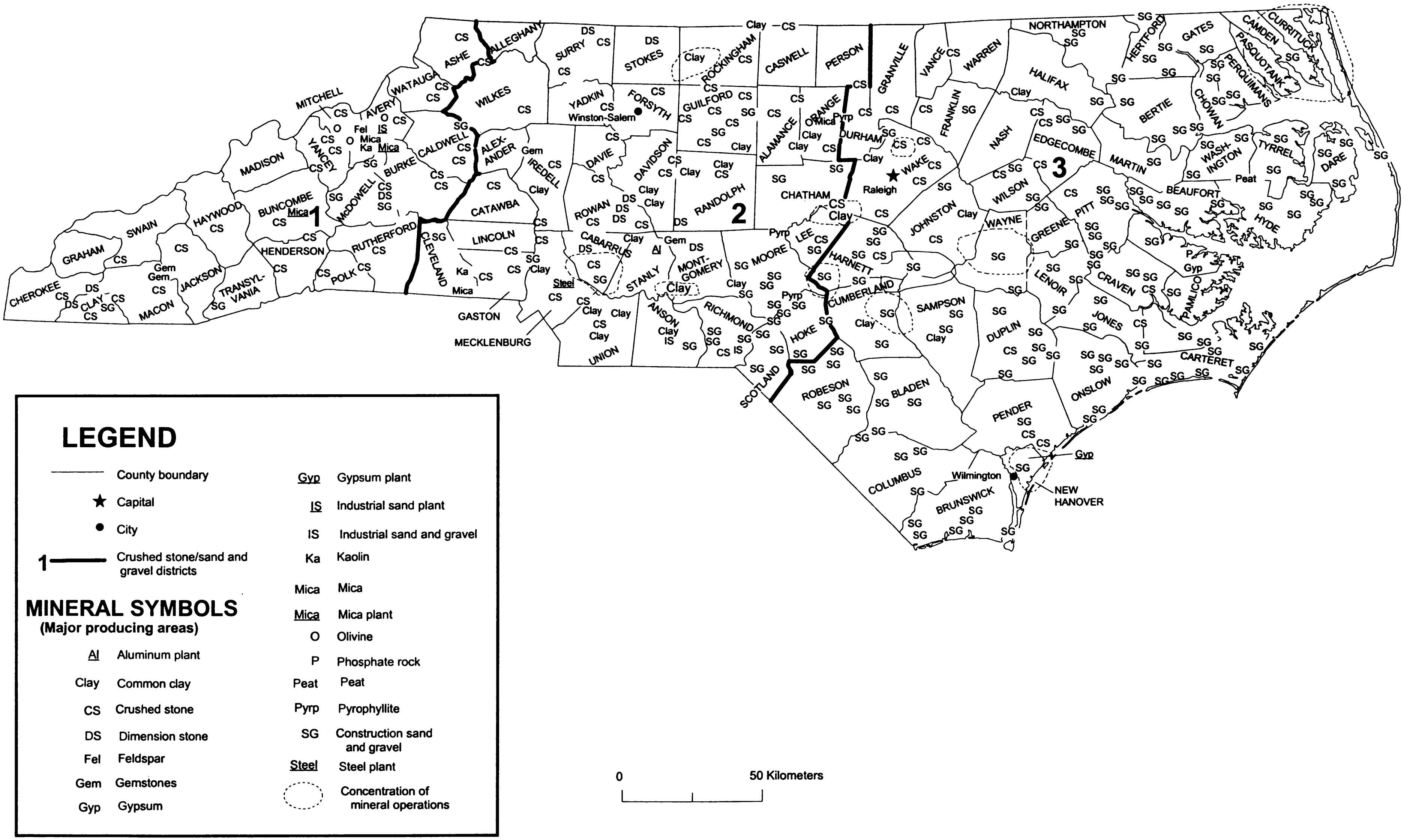
2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement and lime).

4/ Includes railroad ballast.

5/ Reported and estimated production without a breakdown by end use.

NORTH CAROLINA



Source: North Carolina Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for North Carolina was $761 million, according to the U.S. Geological Survey (USGS). This was about a 1% increase from that of 1998[2] and followed a 1.1% increase from 1997 to 1998. The State increased to 18th from 19th in rank among the 50 States in total nonfuel mineral production value, of which North Carolina accounted for about 2% of the U.S. total.

In 1999, the increased value of crushed stone, and less so dimension stone, accounted for most of the State's rise in value. These gains were offset somewhat by decreases in phosphate rock, construction sand and gravel, and lithium minerals, in descending order of change (table 1). In 1998, increases in the values of crushed stone and phosphate rock significantly offset a substantial decrease in the value of lithium minerals and smaller decreases in construction and industrial sand and gravel and feldspar. Lithium mineral production ceased with the 1998 closure of FMC Corp., Lithium Division's, spodumene mine and lithium carbonate plant at Cherryville near Bessemer City, NC.

Based upon 1999 USGS estimates of the quantities of minerals produced in the 50 States, North Carolina continued as the leading State in feldspar, mica, and pyrophyllite; second in common clays and second of 2 States that produced olivine; and seventh in industrial sand and gravel and peat. Whereas the State rose to 3d from 5th in the production of gemstones and to 9th from 13th in dimension stone, it decreased to 3d from 2d of four States that produce phosphate rock and to 8th from 7th in crushed stone. North Carolina mines exclusively have produced industrial minerals since the early 1970's, particularly since the 1971 closing of the Tungsten Queen Mine, an underground tungsten mine in Vance County. Metal production in the State, especially that of primary aluminum, resulted from the processing of recycled materials or raw materials received from other domestic and foreign sources. The North Carolina Geological Survey[3] (NCGS) expanded the "Minerals Information" portion of its Internet site. The additions include (1) information about permitted active and inactive mines (including regional mine location maps, contacts, and other data); (2) geochemistry data and information (stream sediment and domestic well and stream water geochemical data for North Carolina from the National Uranium Resource Evaluation Program); (3) listings of historic North Carolina mineral commodity data and geologic information (located at the NCGS Raleigh (Archdale Building) and Asheville offices); (4) information about obtaining mining permits; (5) a list of reports (primarily on industrial minerals) by the North Carolina State University Minerals Research Laboratory, Asheville (URL http://www.engr.ncsu.edu/mrl); and (6) links to other sites of interest. There is a renewed focus by the NCGS on Geographic Information System (GIS) geologic map making, data base acquisition and preparation, and mineral-resource studies. In 1999, work began on data entry for the National Geologic Mapping Database. Additional information about NCGS activities can be found on the Internet at URL http://www.geology.enr.state.nc.us.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Jeffrey Reid, Senior Geologist for Minerals and Geographic Information Systems, authored the text of mineral industry information submitted by the North Carolina Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Clays: Common	2,460	11,900	2,380	11,600	2,390	11,300
Feldspar metric tons	467,000	18,700	381,000	16,800	396,000	17,000
Gemstones	NA	368	NA	968	NA	969
Sand and gravel:						
Construction	11,100	61,200	10,900	58,000	9,960	53,900
Industrial	1,600	26,400	1,440	24,100	1,440	24,800
Stone:						
Crushed	64,300 r/	468,000 r/	69,700	480,000	71,400	505,000
Dimension metric tons	24,200	12,100	26,200	12,500	41,300	16,200
Combined values of clays (kaolin), lithium minerals (1997-98), mica (crude), olivine, peat, phosphate rock, talc and pyrophyllite	XX	143,000	XX	146,000	XX	132,000
Total	XX	742,000 r/	XX	750,000	XX	761,000

p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	11	6,810	$48,400	$7.10	11	6,310	$41,700	$6.60
Dolomite	1	302	2,010	6.66	1	279	1,870	6.69
Granite	71 r/	46,600 r/	335,000 r/	7.19 r/	76	52,800	365,000	6.91
Calcareous marl	--	--	--	--	1	W	W	4.37
Quartzite	2	W	W	7.41	2	W	W	7.93
Traprock	7	6,560	51,400	7.84	7	6,180	43,400	7.02
Slate	3	W	W	7.55	3	W	W	6.75
Volcanic cinder and scoria	1	W	W	7.58	1	W	W	6.62
Miscellaneous stone	1	W	W	8.40	2	W	W	6.62
Total or average	XX	64,300 r/	468,000 r/	7.27 r/	XX	69,700	480,000	6.89

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$6.47
Riprap and jetty stone	542	$5,930	10.94
Filter stone	169	1,740	10.31
Other coarse aggregate	114	660	5.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,870	17,600	9.43
Bituminous aggregate, coarse	1,670	15,400	9.19
Bituminous surface-treatment aggregate	851	7,860	9.24
Railroad ballast	1,390	7,240	5.21
Other graded coarse aggregate	2,610	23,300	8.96
Fine aggregate (-3/8 inch):			
Stone sand, concrete	223	1,610	7.22
Stone sand, bituminous mix or seal	735	5,240	7.14
Screening, undesignated	1,130	7,520	6.67
Other fine aggregate	336	1,930	5.75
Coarse and fine aggregates:			
Graded road base or subbase	5,820	38,300	6.58
Unpaved road surfacing	562	3,520	6.26
Terrazzo and exposed aggregate	(3/)	(3/)	(3/)
Crusher run or fill or waste	613	3,760	6.14
Other coarse and fine aggregates	2,900	15,400	5.31
Other construction materials	(3/)	(3/)	6.79
Agricultural limestone	5	25	5.00
Other miscellaneous uses: Lightweight aggregate (slate)	(3/)	(3/)	7.18
Unspecified: 4/			
Actual	45,700	306,000	6.70
Estimated	1,890	12,800	6.78
Total or average	69,700	480,000	6.89

W Withheld to avoid disclosing company proprietary data; included with "Other".

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes calcareous marl, dolomite, granite, limestone, miscellaneous stone, quartzite, slate, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data, included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	263	1,990	W	W	W	W
Coarse aggregate, graded 3/	2,370	16,900	W	W	W	W
Fine aggregate (-3/8 inch) 4/	739	5,210	W	W	W	W
Coarse and fine aggregate 5/	2,950	17,000	W	W	W	W
Other construction materials	--	--	13,600	100,000	2,210	19,900
Agricultural 6/	5	25	--	--	--	--
Unspecified: 7/						
Actual	4,520	31,900	21,000	140,000	20,200 8/	135,000 8/
Estimated	873	5,900	--	--	1,020	6,930
Total	11,700	78,900	34,600	240,000	23,400	162,000

W Withheld to avoid disclosing company proprietary data, included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, lightweight aggregate (slate), terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone.

7/ Reported and estimated production without a breakdown by end use.

8/ Includes production from unspecified districts to avoid disclosing company proprietary data.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	3,530	$16,100	$4.56
Plaster and gunite sands	24	158	6.58
Concrete products (blocks, bricks, pipe, decorative, etc.)	335	1,530	4.57
Asphaltic concrete aggregates and other bituminous mixtures	715	2,690	3.76
Road base and coverings 2/	917	5,400	5.89
Fill	1,080	3,250	3.02
Snow and ice control	8	38	4.75
Other miscellaneous uses 3/	1,460	15,900	10.89
Unspecified: 4/			
Actual	2,470	11,400	4.62
Estimated	397	1,500	3.79
Total or average	10,900	58,000	5.31

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Includes filtration and railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	271	1,780	1,020	4,790	2,260	9,690
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	122	447	213	1,080
Asphaltic concrete aggregate and road base materials 3/	684	4,620	768	2,680	530	2,110
Fill	96	652	254	665	725	1,930
Other miscellaneous uses 4/	130	868	634	12,900	354	864
Unspecified: 5/						
Actual	--	--	1,030	4,840	1,450	6,600
Estimated	22	49	126	520	249	934
Total	1,200	7,970	3,950	26,800	5,780	23,200

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

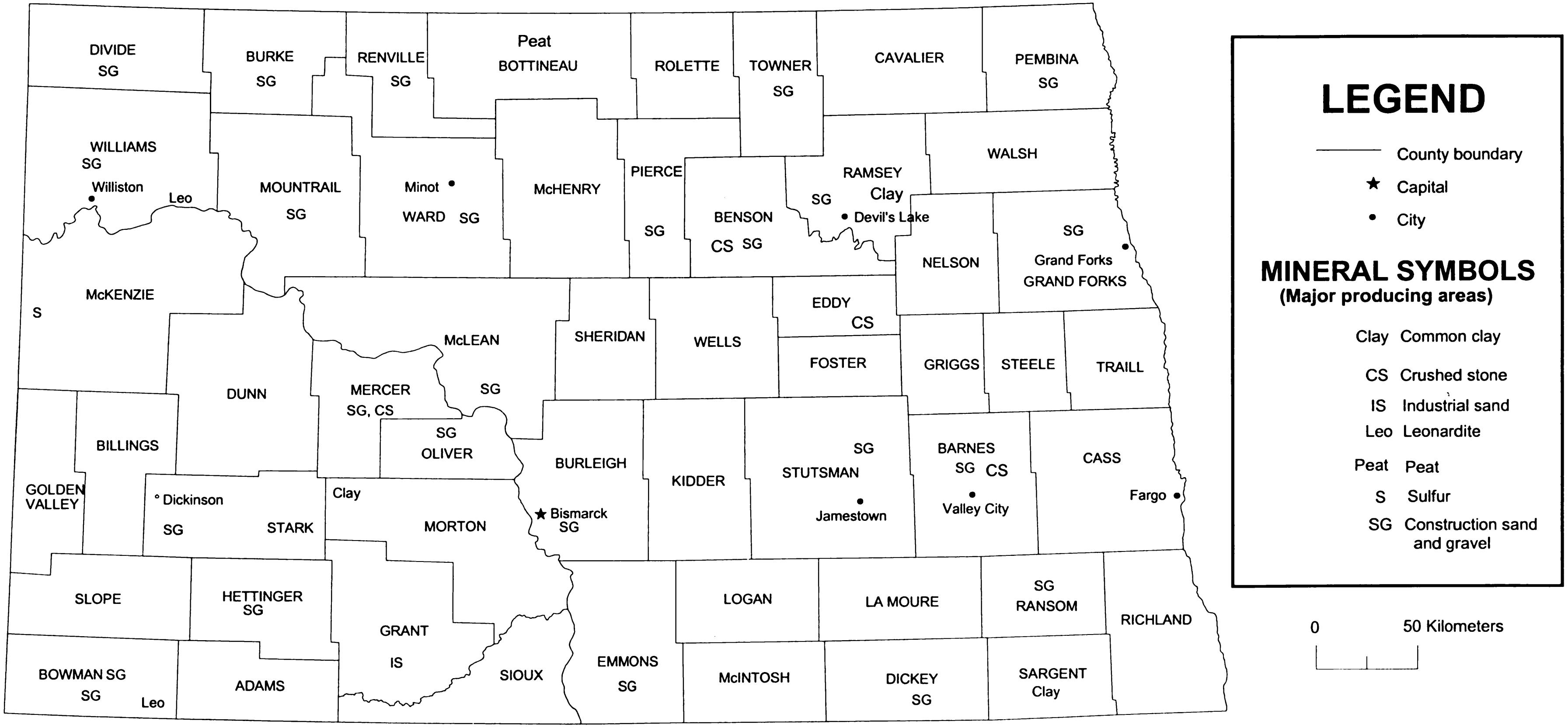
2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement).

4/ Includes filtration, railroad ballast, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

NORTH DAKOTA



Source: North Dakota Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF NORTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for North Dakota was $37.7 million, according to the U.S. Geological Survey (USGS). This was about a 2% decrease from that of 1998,[2] and followed a 13.6% increase in 1998 from 1997.

North Dakota's leading nonfuel mineral by value was construction sand and gravel. This high-volume, low-value commodity accounted for nearly 79% of the State's nonfuel mineral production value. In 1999, all nonfuel minerals showed slight increases in value, except for construction sand and gravel, which had a small decrease, and gemstones, which was unchanged (table 1). In 1998, only construction sand and gravel, up $3.6 million, showed any significant change, the increase of which accounted for most of the State's increase in value. All other nonfuel minerals increased slightly, except for common clay, which had a small decrease.

The following narrative information was provided by the North Dakota Geological Survey[3] (NDGS). During 1999, 17 surface mining operations were operational, as reported to the State Soil Conservation Committee (SSCC). (The SSCC collects production data by volume, unlike the USGS, which collects data by mass or metric tons produced.) Based on these reports, 125 hectares (ha) were affected. The quantity of minerals mined included more than 2.7 million cubic meters (Mm^3) of sand and gravel, 67,800 cubic meters (m^3) of clay, and about 108,000 m^3 of crushed stone, 1,680 m^3 of scoria, totaling about 2.88 Mm^3 of mineral material. From 61 pits ranging in size from more than 0.1 ha to 16 ha, a total of approximately 572,000 m^3 of overburden were disturbed.

Leonardite is an oxidized lignite. Currently, Georesources, Inc. of Williston and American Colloid Co. of Scranton operate the only leonardite mines in North Dakota. The two companies produced a combined total of approximately 32,000 metric tons (t) of leonardite in 1999. Leonardite is processed and used as a dispersant and viscosity control in oil well drilling muds, as a stabilizer for ion-exchange resins in water treatment, and as a soil conditioner.

The SSCC, as designated by the State legislature, continues to administer the Surface Mining Report Law, which requires any person conducting surface mining operations for minerals other than coal to comply with the reporting requirements of North Dakota Century Code Chapter 38-16. Minerals included under the law are cement rock, clay, gravel, limestone, manganese, molybdenum, peat, potash, pumicite, salt, sand, scoria, stone, sodium sulfate, zeolite, and other minerals (except coal). The SSCC has the regulatory authority to administer the reporting requirement, while the actual regulatory authority for most of these mining activities rests with the NDGS. The law requires that any person or company that within one calendar year removes 7,650 m^3 (10,000 cubic yards) or more of earthen materials or products (including overburden) affecting 0.2 ha (0.5 acre) or more in combined mining operations must report the particulars of its surface mining activities. Some operators of smaller operations cooperate by voluntarily submitting summary reports to the SSCC, although not required by law. Nevertheless, because not all operations report, the summary of surface mining statistics presented above is a conservative estimate of the amount of nonfuel minerals mined in North Dakota in 1999.

The coal gasification plant near Beulah continued to operate an anhydrous ammonia plant. The plant, in operation since spring 1997, has the capacity to produce 1,180 metric tons per day (t/d) of anhydrous ammonia. The plant averaged 663 t/d during 1999 due to several extended power outages at the plant. Total production of anhydrous ammonia in 1999 was 242,000 t. In 1999, the gasification plant also produced more than 3.6 million liters (ML) of krypton and xenon; over 8,100 t (16.3 million pounds) of phenol; over 13,600 t (27.3 million pounds) of cresylic acid; over 32 ML (8.5 million gallons) of naptha; almost 4.2 ML (1.1 million gallons) of methanol; and about 243,000 liters (64,300 gallons) of liquid nitrogen. Ammonium sulfate production from the stack gas scrubber was 149,000 t in 1999.

The NDGS continued entering all geologic information from its subsurface mineral program into a computerized data base. This information will be used for a number of purposes, including redefining the State's fuel minerals (lignite, uranium, and coalbed methane) and generating useful information on the State's nonfuel minerals, especially sand and gravel, claystone, and leonardite.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Edward C. Murphy, Geologist, authored the text of State mineral industry information submitted by the North Dakota Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH DAKOTA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Clays: Common	56	W	42	W	44	W
Gemstones	NA	3	NA	3	NA	3
Sand and gravel: Construction	9,360	26,800	10,700	30,400	10,200	29,600
Stone: Crushed	--	--	71 3/	232 3/	80 3/	268 3/
Combine values of lime, peat (1998), sand and gravel (industrial), stone [crushed volcanic cinder (1998-99)], and values indicated by symbol W	XX	6,890	XX	7,630	XX	7,850
Total	XX	33,700	XX	38,300	XX	37,700

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable. -- Zero.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and values included with "Combined values" data.

TABLE 2
NORTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Volcanic cinder and scoria	--	--	--	--	1	W	W	W
Miscellaneous stone	--	--	--	--	5	71	232	$3.27
Total or average	XX	--	--	--	XX	71	232	3.27

W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NORTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	228	$1,400	$6.16
Asphaltic concrete aggregates and other bituminous mixtures	679	1,530	2.25
Road base and coverings	2,250	4,750	2.11
Fill	212	377	1.78
Other miscellaneous uses 3/	11	62	5.64
Unspecified: 4/			
Actual	2,350	8,580	3.65
Estimated	4,980	13,700	2.76
Total or average	10,700	30,400	2.84

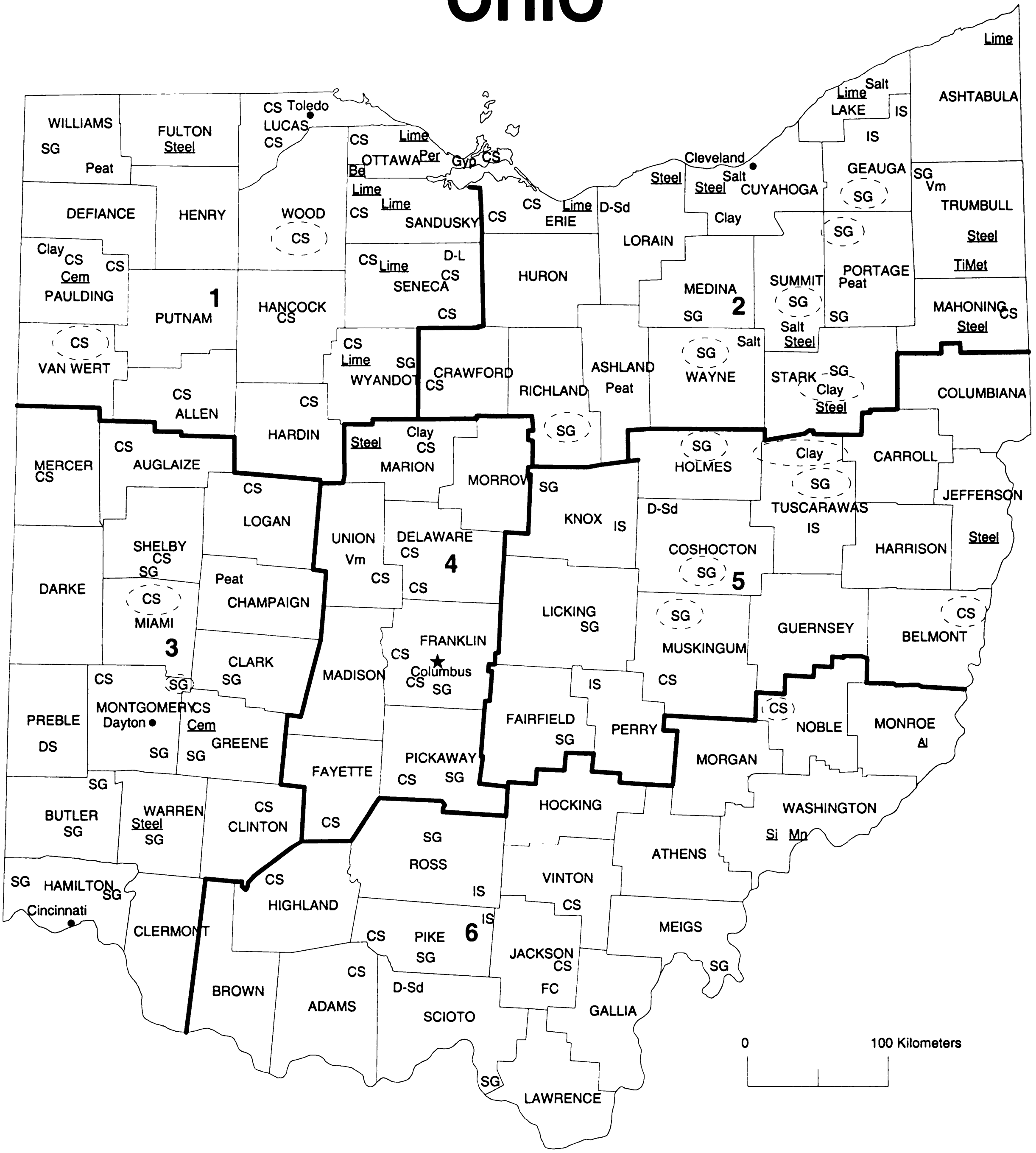
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ To avoid disclosing company proprietary data, no district tables were produced in 1998.

3/ Includes railroad ballast and snow and ice control.

4/ Reported and estimated production without a breakdown by end use.

OHIO



LEGEND

―	County boundary
★	Capital
●	City
1 ━	Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major Producing areas)

Al	Aluminum plant	Gyp	Gypsum	Si	Silicon metal plant
Be	Beryllium plant	IS	Industrial sand	Steel	Steel plant
Cem	Cement plant	Lime	Lime plant	TiMet	Titanium metal plant
CS	Crushed stone	Mn	Manganese dioxide plant	Vm	Vemiculite
D-L	Dimension limestone	Peat	Peat	◌	Concentration of mineral operations
D-S	Dimension stone	Per	Perlite plant		
D-Sd	Dimension sandstone	Salt	Salt		
FC	Fire clay	SG	Construction sand and gravel		

Source: Ohio Division of Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF OHIO

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Ohio Department of Natural Resources, Division of Geological Survey, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Ohio was $1.04 billion, according to the U.S. Geological Survey (USGS). This was a 1% increase from that of 1998,[2] and followed an increase of 2.8% from 1997 to 1998. The State ranked 14th in the Nation (13th in 1998) in total nonfuel mineral production value, of which Ohio accounted for more than 2.5% of the U.S. total.

In 1999, Ohio's rise in value resulted mostly from a $13 million increase in construction sand and gravel plus a total combined increase of about $5 million in industrial sand and gravel and portland cement. These gains were offset somewhat by decreases of $4 million and $3 million, respectively, in lime and crushed stone. All other changes in value were relatively small, and had minimal impact on the State's total mineral value. In 1998, significant increases occurred in the values of construction sand and gravel (up $33 million) and portland cement; a $5 million decrease in crushed stone, along with smaller decreases in masonry cement and lime, somewhat reduced the State's overall gain for the year (table 1).

Compared with USGS estimates of the quantities produced in the other 49 States during 1999, Ohio remained second in fire clay; fourth in construction sand and gravel (virtually tied with Arizona), salt, and lime; fifth in common clays; and ninth in industrial sand and gravel. The State dropped to seventh from fifth in crushed stone and lime, and was a significant producer of dimension stone and portland cement. The State's mines exclusively produced industrial minerals and coal; any metals, especially steel and aluminum, produced in the State were processed from materials received from other domestic and foreign sources. Ohio continued to be the Nation's second leading raw-steel-manufacturing State with an estimated output of about 15.8 million metric tons (Mt) of raw steel, as reported by the American Iron and Steel Institute. Based upon USGS data, the State remained the fourth leading producer of primary aluminum in the Nation in 1999.

The Ohio Department of Natural Resources, Division of Geological Survey (DGS), provided the following narrative information.[3] Aggregate production (crushed limestone and dolomite, crushed sandstone, and sand and gravel) continued to be strong, reaching 128 Mt. The Ohio Department of Transportation awarded $1 billion in contracts in 1999. New construction and resurfacing accounted for more than $481 million. The 10-year $535 million reconstruction of I-71 between Columbus and Cleveland continued with increased activity planned for 2000. Railroad delays associated with Norfolk Southern Corp. and CSX Corp. assuming operational control of Conrail caused production slowdowns at some limestone quarries, but several million dollars invested in additional rail capacity should begin to alleviate the bottlenecks. Commercial, residential, and retail construction continued to be strong, particularly in the Columbus area. Belden Brick Co. completed the construction of a new high-tech brick plant at Sugarcreek in Tuscarawas County. Kilns, dryers, production equipment, and environmental controls are computer-controlled for graphical and tabular evaluation and for optimal control of the plant.

Carmeuse North American Group shutdown its lime kiln at Woodville, OH, but will continue to produce stone at the facility. This action was due in part to the startup in October 1999 of Carmeuse's newly renovated dolomitic lime plant at Maple Grove, OH, which will have the advantage of being newer, larger, and able to produce the higher purity lime required by Carmeuse's customers.

The Sun Coke Co. of Knoxville, TN, proposed building a $1 billion coke plant in Scioto County. It could be the largest brick construction project in U.S. history (Drietzler, 1999). CAES Development Group of Houston purchased land and storage rights to most of the former PPG Industries, Inc.'s underground limestone mine in Barberton. It plans to spend $100 million to develop a powerplant. CAES will pressurize the mine at night with compressed air, when power is cheap, and release the air through turbines to produce electricity when power is more expensive (Dorell, 1999).

Ohio will begin the most extensive warranty system for highway construction in the Nation during 2000. Specifications developed for warranties in 1999 include 7-years for new construction and major rehabilitation, 5 years for repaving, and 2 years for remaining work. Twenty percent of new construction and 10% of the total payments for contracts awarded each year must have warranties. The Ohio Department of Transportation will assume responsibility for any road-base defects (Jacomet, 1999).

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/ comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] David Stith, Geologist and Supervisor, and Mark Wolfe, Geologist, authored the text of the Ohio mineral industry information submitted by the Division of Geological Survey.

DGS opened the Horace R. Collins Laboratory and core sample warehouse at Alum Creek State Park (Delaware County) in October 1999. A large conference room, geologic learning center, offices for the Industrial Minerals Group, core examination room, and aggregate testing laboratories are included in the 3,500 square meter building. This new facility replaces inadequate rental properties, and promises to be a valuable tool for the mineral industry.

References Cited

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Dreitzler, Bob, 1999, Jobless find hope in plant: The Columbus Dispatch, December 27.

Jacomet, P.A., 1999, Specification update: Ohio Aggregates and Industrial Minerals Association Annual Meeting, November 9-10, 1999, Columbus, OH.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OHIO 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland	1,040	76,900 e/	W	W	W	W
Clays:						
Common	1,450	7,050	1,530	7,290	1,540	7,100
Fire	61	2,860	62	2,810	62	2,810
Gemstones	NA	3	NA	3	NA	3
Lime	1,960	111,000	1,870	109,000	1,810	105,000
Sand and gravel:						
Construction	47,000	222,000	52,600	255,000	54,400	268,000
Industrial	1,140	28,600	1,110	27,700	1,170	30,200
Stone:						
Crushed	74,100	357,000 r/	75,600	352,000	73,000	349,000
Dimension metric tons	24,900	3,260	24,100	2,360	21,900	2,360
Combined values of cement (masonry), gypsum (crude), peat, salt, silica stone and values indicated by symbol W	XX	193,000	XX	276,000	XX	279,000
Total	XX	1,002,000 r/	XX	1,030,000	XX	1,040,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
OHIO: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	93 r/	59,800 r/	$295,000 r/	$4.93 r/	104	58,800	$270,000	$4.59
Dolomite	16 r/	12,100 r/	54,900 r/	4.56 r/	16	12,500	59,900	4.79
Limestone-dolomite	3 r/	2,220 r/	7,580 r/	3.41 r/	3	2,640	12,500	4.73
Sandstone	4	44	197	4.48	10	1,640	9,340	5.70
Total or average	XX	74,100	357,000 r/	4.82 r/	XX	75,600	352,000	4.65

r/ Revised. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	846	$4,730	$5.58
Filter stone	26	148	5.69
Other coarse aggregate	1,870	6,790	3.63
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,370	15,100	4.49
Bituminous aggregate, coarse	2,940	13,800	4.68
Bituminous surface-treatment aggregate	391	2,080	5.31
Railroad ballast	464	1,920	4.13
Other graded coarse aggregate	2,760	12,100	4.40
Fine aggregate (-3/8 inch):			
Stone sand, concrete	629	2,190	3.48
Stone sand, bituminous mix or seal	586	2,330	3.97
Screening, undesignated	385	1,380	3.59
Other fine aggregate	158	667	4.22
Coarse and fine aggregates:			
Graded road base or subbase	17,600	75,500	4.29
Unpaved road surfacing	2,000	8,560	4.27
Crusher run or fill or waste	453	1,780	3.92
Other coarse and fine aggregates	2,720	12,100	4.44
Other construction materials	W	W	5.00
Agricultural: Agricultural limestone	1,020	4,520	4.45
Chemical and metallurgical:			
Cement manufacture	(3/)	(3/)	4.70
Flux stone	(3/)	(3/)	5.58
Glass manufacture	(3/)	(3/)	12.17
Other chemical and metallurgical	2,170	12,000	5.51
Special:			
Asphalt fillers or extenders	(3/)	(3/)	4.55
Whiting or whiting substitute	(3/)	(3/)	25.08
Other fillers or extenders	(3/)	(3/)	6.84
Other special uses	417	3,400	8.16
Other miscellaneous uses:			
Building products	5	80	8.16
Other specified uses not listed	W	W	15.92
Unspecified: 4/			
Actual	24,700	116,000	4.71
Estimated	9,780	53,000	5.41
Total or average	75,600	352,000	4.65

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

2/ Includes dolomite, limestone, limestone-dolomite, and sandstone.

3/ Withheld to avoid disclosing company proprietary data; included with "Other" listing.

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
OHIO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4		District 5		District 6		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:														
Coarse aggregate (+1 1/2 inch) 2/	606	3,050	1,370	4,740	276	1,430	87	428	321	1,560	73	391	14	63
Coarse aggregate, graded 3/	5,210	23,500	2,530	11,800	1,020	4,020	273	1,540	W	W	304	1,500	W	W
Fine aggregate (-3/8 inch) 4/	691	2,660	W	W	185	724	23	127	192	735	W	W	153	506
Coarse and fine aggregate 5/	9,730	44,400	2,860	13,500	2,990	13,000	4,640	16,000	1,430	6,370	W	W	W	W
Other construction materials	W	W	--	--	--	--	W	W	--	--	--	--	--	--
Agricultural 6/	429	1,950	145	654	120	475	31	163	171	565	120	712	--	--
Chemical and metallurgical 7/	W	W	W	W	W	W	--	--	--	--	--	--	--	--
Special 8/	158	1,890	W	W	W	W	--	--	--	--	--	--	--	--
Other miscellaneous use 9/	W	W	--	--	--	--	--	--	--	--	--	--	--	--
Unspecified: 10/														
Actual	8,350	40,100	2,490	12,200	2,770	12,400	6,300	27,800	W	W	W	W	W	W
Estimated	2,710	15,000	153	867	1,870	9,820	W	W	W	W	1,950	10,600	--	--
Total	29,500	142,000	10,200	46,700	10,200	46,700	12,700	52,800	4,160	20,500	8,060	40,400	798	3,210

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone.

7/ Includes cement manufacture, flux stone, and glass manufacture.

8/ Includes asphalt fillers or extenders, whiting or whiting substitute, and other fillers or extenders.

9/ Includes building products and other specified uses not listed.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	8,290	$39,400	$4.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	577	3,550	6.14
Asphaltic concrete aggregates and other bituminous mixtures	3,790	17,800	4.71
Road base and coverings 3/	2,970	14,700	4.93
Fill	3,710	15,700	4.23
Snow and ice control	69	250	3.62
Filtration	164	834	5.09
Other miscellaneous uses 4/	2,890	15,800	5.49
Unspecified: 5/			
Actual	20,000	96,500	4.83
Estimated	10,200	50,000	4.90
Total or average	52,600	255,000	4.84

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sand.

3/ Includes road and other stabilization (cement).

4/ Includes railroad ballast and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

TABLE 6
OHIO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	182	1,160	3,260	16,000	2,320	10,100
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	338	1,580	135	1,430
Asphaltic concrete aggregate and other bituminous mixtures	W	W	1,690	7,590	668	2,570
Roadbase and coverings 3/	8	34	852	5,320	356	2,060
Fill	W	W	1,450	8,080	1,830	5,390
Snow and ice control	--	--	22	103	W	W
Other miscellaneous uses 4/	W	W	227	1,250	W	W
Unspecified: 5/						
Actual	W	W	2,360	13,400	11,500	52,800
Estimated	261	1,070	1,620	9,720	2,580	12,300
Total	958	4,440	11,800	63,000	19,700	88,800

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	979	4,130	1,260	7,030	280	984
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	W	W	W	W
Asphaltic concrete aggregate and other bituminous mixtures	W	W	744	4,550	191	929
Roadbase and coverings 3/	862	2,460	769	4,090	126	703
Fill	W	W	129	627	62	129
Snow and ice control	W	W	33	93	--	--
Other miscellaneous uses 4/	W	W	W	W	W	W
Unspecified: 5/						
Actual	2,830	14,200	W	W	944	4,140
Estimated	326	1,640	3,180	14,300	2,230	11,000
Total	7,160	34,600	8,540	42,100	4,420	21,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

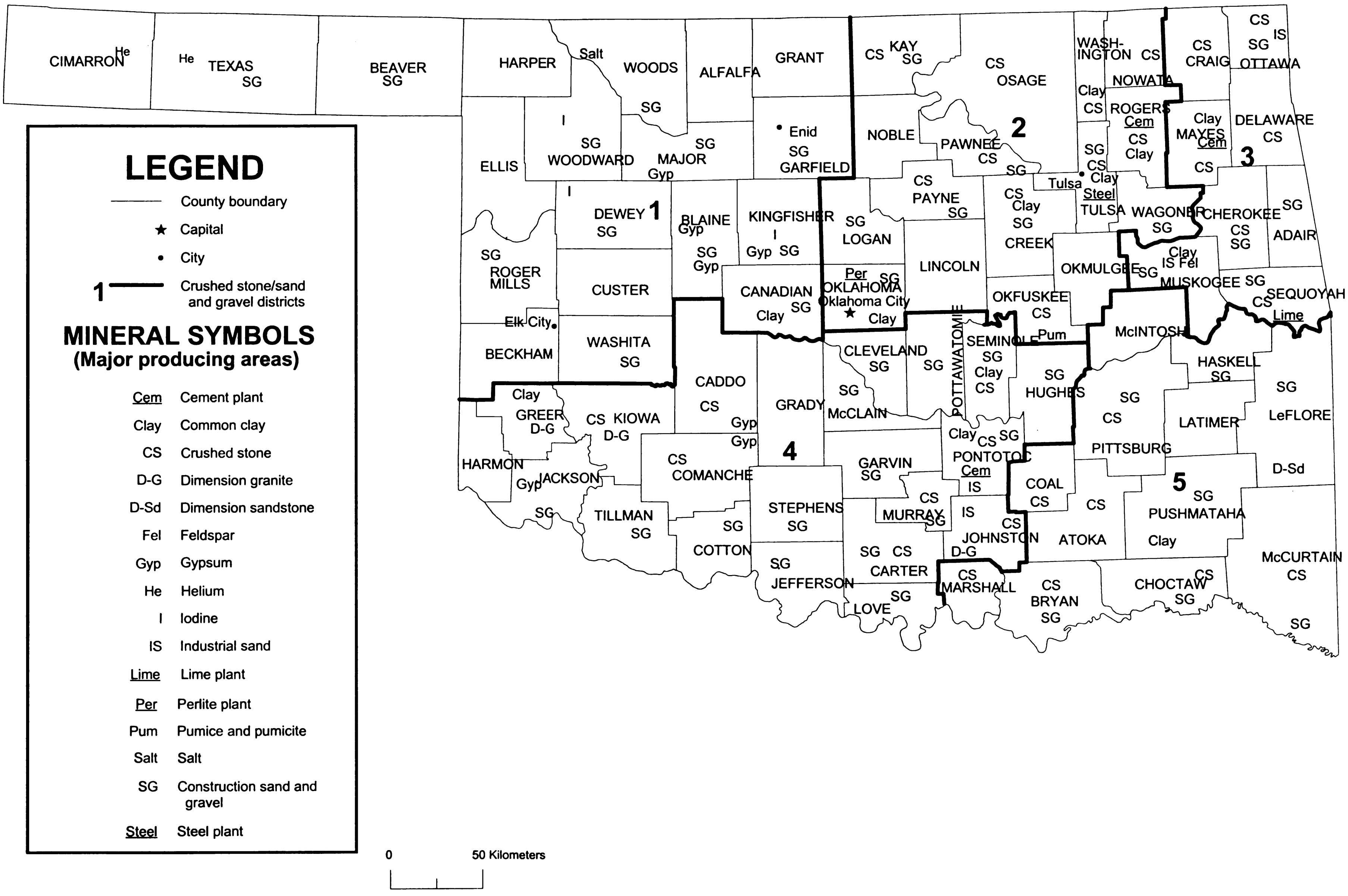
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

OKLAHOMA



LEGEND

—	County boundary
★	Capital
•	City
1 —	Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
D-G	Dimension granite
D-Sd	Dimension sandstone
Fel	Feldspar
Gyp	Gypsum
He	Helium
I	Iodine
IS	Industrial sand
Lime	Lime plant
Per	Perlite plant
Pum	Pumice and pumicite
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant

Source: Oklahoma Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF OKLAHOMA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Oklahoma Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Oklahoma was $477 million, according to the U.S. Geological Survey (USGS). This was a 4% increase from that of 1998,[2] following nearly an 18% increase from 1997 to 1998. The State remained 31st in rank among the 50 States in total nonfuel mineral production value, of which Oklahoma accounted for about 1% of the U.S. total.

In 1999, crushed stone and portland cement were Oklahoma's leading nonfuel mineral commodities, accounting for 34% and 29%, respectively, of the State's total nonfuel mineral value. The combined values of construction materials—crushed stone, cement (portland and masonry), construction sand and gravel, gypsum, and common clay, in descending order of value—accounted for almost 77% of the total value. Oklahoma's increase in 1999 mostly resulted from the higher values of crushed stone, construction sand and gravel, and portland cement, in descending order of change (table 1). Smaller yet significant increases also occurred in Grade-A helium, iodine, and salt. Only crude helium had much of a decrease, dropping by more than $5 million. In 1998, increases in crushed stone, Grade-A helium (up more than $19 million), construction sand and gravel, crude helium, crude iodine, and gypsum led the State's increase in value; several nonfuel minerals had decreases in value but these were small and had little effect on the overall net result (table 1).

Oklahoma's mines exclusively produced industrial minerals; no metals were mined in the State. Based upon USGS estimates of the quantities produced in the 50 States during 1999, Oklahoma remained the only State that produced iodine, first in gypsum, second of four States that produce tripoli, third in Grade-A helium and third of three States in crude helium, fifth in feldspar, and eighth in industrial sand and gravel. Additionally, significant quantities of crushed stone, portland and masonry cements, common clays, and gemstones (descending order of value) were produced in the State.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OKLAHOMA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Cement:						
Masonry	89	6,500 e/	96	7,140 e/	98	7,000 e/
Portland	1,900	132,000 e/	1,830	132,000 e/	1,880	136,000 e/
Clays: Common	653	4,430	658	4,450	662	4,330
Gemstones	NA	354	NA	53	NA	224
Gypsum, crude	3,100	17,500	3,020	19,500	3,090	19,900
Iodine, crude metric tons	1,320	19,600	1,490	22,700	1,630	24,600
Sand and gravel:						
Construction	8,250	29,000	9,000	35,900	9,950	40,500
Industrial	1,380	28,200	1,380	29,600	1,380	29,600
Stone:						
Crushed	31,400 r/ 3/	108,000 r/ 3/	38,500	152,000	39,400	160,000
Dimension metric tons	5,770	995	3,480	635	1,580	578
Combined values of feldspar, helium, lime, salt, stone [crushed shell, traprock, and miscellaneous (1997)], tripoli, and values indicated by symbol W	XX	38,600	XX	55,600	XX	54,600
Total	XX	384,000 r/	XX	460,000	XX	477,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
OKLAHOMA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	41 r/	25,800 r/	$79,500 r/	$3.08 r/	44	27,500	$108,000	$3.93
Dolomite	3 r/	1,790 r/	7,950 r/	4.43 r/	3	1,570	6,570	4.20
Granite	3	W	W	5.48 r/	3	6,720	25,700	3.83
Sandstone	7 r/	2,490 r/	13,100 r/	5.28 r/	6	1,210	4,450	3.69
Shell	1 r/	W	W	W	--	--	--	--
Miscellaneous stone	3 r/	(2/)	(2/)	(2/)	3	1,500	7,130	4.76
Total or average	XX	31,400 r/	108,000 r/	3.43 r/	XX	38,500	152,000	3.95

r/ Revised. W Withheld to avoid disclosing proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Withheld to avoid disclosing company proprietary data; excluded from "Total."

TABLE 3
OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousand	Unit Value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	276	$1,660	$6.00
Filter stone	66	386	5.84
Other coarse aggregate	62	324	5.23
Coarse aggregate, graded:			
Concrete aggregate, coarse	5,990	26,800	4.48
Bituminous aggregate, coarse	363	1,880	5.16
Bituminous surface-treatment aggregate	699	3,330	4.76
Railroad ballast	W	W	3.91
Other graded coarse aggregate	9,110	37,400	4.49
Fine aggregate (-3/8 inch):			
Stone sand, concrete	468	1,650	3.52
Stone sand, bituminous mix or seal	169	702	4.15
Screening, undesignated	1,160	4,560	3.92
Other fine aggregate	752	2,840	3.77
Coarse and fine aggregates:			
Graded road base or subbase	1,880	8,240	4.37
Unpaved road surfacing	W	W	3.85
Crusher run or fill or waste	2,410	8,680	3.60
Other coarse and fine aggregates	407	1,564	3.84
Other construction materials	220	1,050	4.77
Agricultural limestone	(3/)	(3/)	3.87
Chemical and metallurgical: Cement manufacture	2,090	10,100	4.82
Special: Other fillers or extenders	(3/)	(3/)	6.61
Unspecified: 4/			
Actual	9,360	30,200	3.23
Estimated	2,440	7,720	3.17
Total or average	38,500	152,000	3.95

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, granite, limestone, miscellaneous stone, sandstone, and shell.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
OKLAHOMA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 2		District 3		District 4		District 5	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	223	1,490	85	448	W	W	W	W
Coarse aggregate, graded 4/	4,570	22,200	502	2,540	9,610	38,400	1,480	6,310
Fine aggregate (-3/8 inch) 5/	676	2,670	W	W	W	W	324	1,300
Coarse and fine aggregate 6/	2,090	8,670	1,040	3,850	772	2,680	1,080	4,380
Other construction materials	--	--	220	1,050	--	--	--	--
Agricultural 7/	W	W	W	W	--	--	W	W
Chemical and metallurgical 8/	1,050	4,610	--	--	1,040	5,460	--	--
Special 9/	--	--	--	--	W	W	--	--
Unspecified: 10/								
Actual	W	W	W	W	W	W	--	--
Estimated	W	W	325	1,020	650	2,130	W	W
Total	10,100	44,000	3,880	14,600	20,200	77,000	4,300	16,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported in District 1.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.

7/ Includes agricultural limestone.

8/ Includes cement manufacture.

9/ Includes other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	3,980	$18,000	$4.53
Plaster and gunite sands	199	977	4.91
Concrete products (blocks, bricks, pipe, decorative, etc.)	54	280	5.19
Asphaltic concrete aggregates and other bituminous mixtures	197	559	2.84
Road base and coverings	267	851	3.19
Fill	843	1,490	1.77
Other miscellaneous uses	3	29	9.67
Unspecified: 2/			
Actual	1,650	6,990	4.23
Estimated	1,810	6,770	3.74
Total or average	9,000	35,900	3.99

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Reported and estimated production without a breakdown by end use.

TABLE 6
OKLAHOMA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	632	2,840	1,260	4,870
Asphaltic concrete aggregates and road base materials	185	597	158	582
Fill	133	209	479	943
Other miscellaneous uses	3	29	--	--
Unspecified 3/	472	3,030	1,110	3,070
Total	1,420	6,700	3,010	9,460
	District 4		Districts 3 and 5 4/	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,420	6,680	912	4,880
Asphaltic concrete aggregates and road base materials	W	W	W	W
Fill	149	221	81	120
Unspecified 3/	W	W	W	W
Total	2,550	11,500	1,230	6,430

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

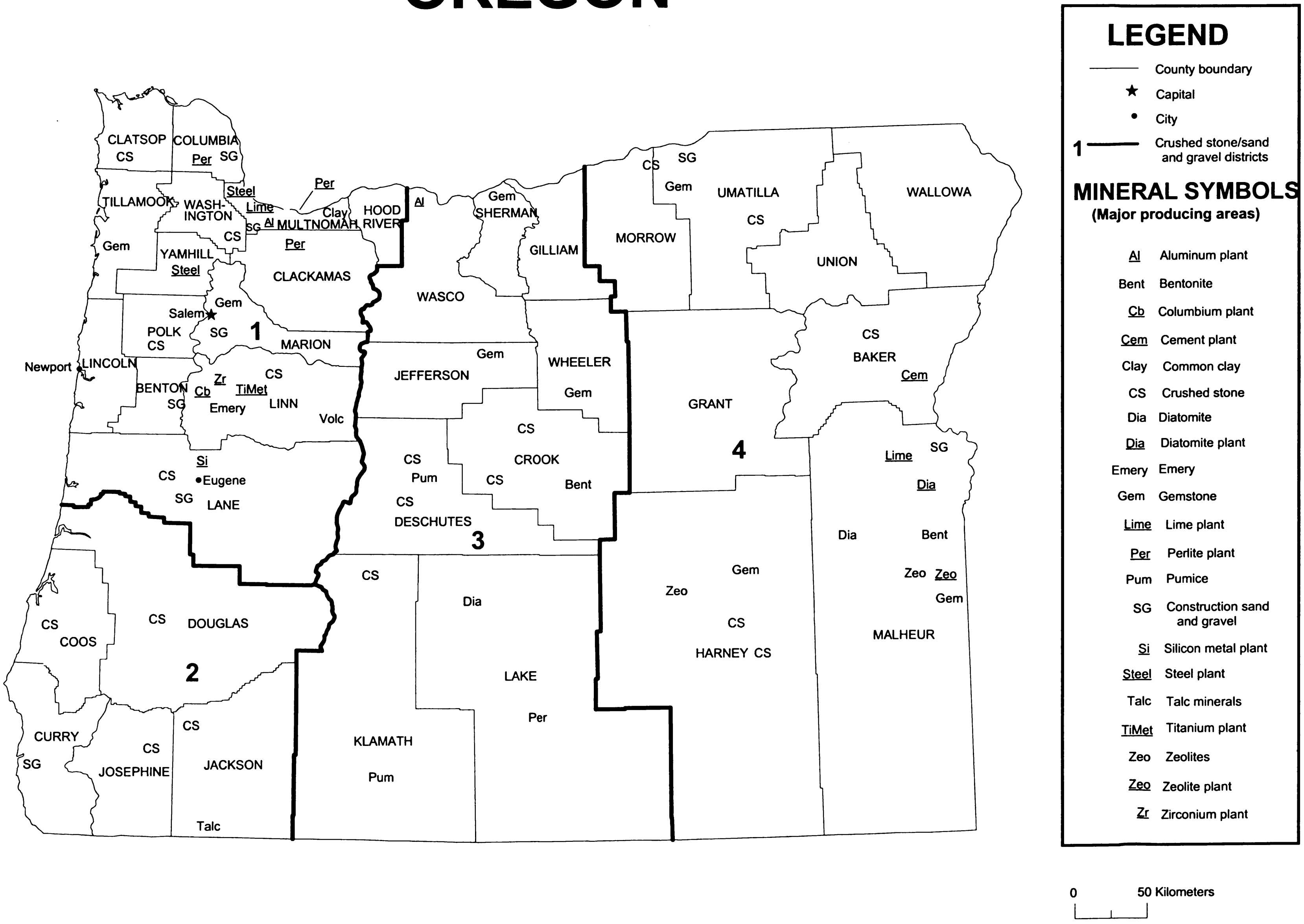
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Reported and estimated production without a breakdown by end use.

4/ Districts 3 and 5 are combined to avoid disclosing company proprietary data.

OREGON



Source: Oregon Department of Geology and Mineral Industries/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF OREGON

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Oregon was $303 million, according to the U.S. Geological Survey (USGS). This was a 1% increase from that of 1998,[2] and followed a 5.6% increase from 1997 to 1998.

Industrial minerals accounted for all of Oregon's nonfuel mineral production. Crushed stone and construction sand and gravel, by value, remained Oregon's two leading nonfuel mineral commodities in 1999, together accounting for more than 70% of the State's total. In 1999, the increased values of pumice, lime, and portland cement more than offset decreases in construction sand and gravel, crushed stone, gemstones (descending order of change), resulting in a net increase for the year. All other nonfuel minerals had relatively small increases in value. In 1998, significant increases in the production values of crushed stone, portland cement, and diatomite, offset somewhat by decreases in construction sand and gravel and pumice, led the State's gain over the preceding year (table 1).

Based upon USGS estimates of the quantities of raw minerals produced in the United States during 1999, Oregon remained the only State to produce emery, first among six States that produce pumice and pumicite, and third in diatomite and zeolites. The State rose in rank to third from fourth in perlite, dropped to seventh from fourth in gemstones (by value), and produced significant quantities of construction sand and gravel and crushed stone.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN OREGON 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	W	W	177	W	180	W
Gemstones	NA	980	NA	1,500	NA	649
Sand and gravel: Construction	19,100	100,000	18,600	99,200	17,700	96,500
Stone: Crushed	21,200	110,000	23,200	118,000	22,500	117,000
Zeolite	(3/)	NA	(3/)	NA	NA	NA
Combined values of cement [masonry (1997), portland], clays (bentonite), diatomite, emery, lime, perlite (crude), pumice and pumicite, talc and pyrophyllite, and values indicated by symbol W	XX	74,100	XX	82,400	XX	88,000
Total	XX	285,000	XX	301,000	XX	303,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data.

TABLE 2
OREGON: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	$6.58	1	W	W	$7.43
Granite	2	W	W	5.03	28	165	$777	4.71
Marble	--	--	--	--	1	W	W	4.93
Sandstone	--	--	--	--	1	14	62	4.43
Traprock	161 r/	19,600 r/	$100,000 r/	$5.12 r/	225	19,400	97,300	5.02
Miscellaneous stone	25 r/	810 r/	4,120 r/	5.08	41	2,730	13,100	4.81
Total	XX	21,200	110,000	5.19	XX	23,200	118,000	5.08

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	70	$241	$3.45
Riprap and jetty stone	807	3,440	4.26
Filter stone	117	657	5.62
Other coarse aggregate	121	509	4.20
Coarse aggregate, graded:			
Concrete aggregate, coarse	242	1,220	5.05
Bituminous aggregate, coarse	524	2,840	5.42
Bituminous surface-treatment aggregate	48	297	6.19
Railroad ballast	341	2,290	6.70
Other graded coarse aggregate	32	213	6.64
Fine aggregate (-3/8 inch):			
Stone sand, concrete	39	245	6.28
Stone sand, bituminous mix or seal	143	820	5.74
Screening, undesignated	31	111	3.59
Other fine aggregate	44	298	6.76
Coarse and fine aggregates:			
Graded road base or subbase	4,820	28,600	5.95
Unpaved road surfacing	2,040	9,060	4.44
Terrazzo and exposed aggregate	254	1,260	4.96
Crusher run or fill or waste	2,140	10,600	4.94
Other coarse and fine aggregates 3/	1,500	7,110	4.73
Other construction materials 4/	66	302	4.58
Chemical and metallurgical: Cement manufacture	W	W	5.66
Other miscellaneous uses: Sugar refining	W	W	12.23
Unspecified: 5/			
Actual	3,830	18,300	4.78
Estimated	5,110	23,000	4.51
Total or average	23,200	118,000	5.08

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

2/ Includes granite, limestone, marble, miscellaneous stone, sandstone, and traprock.

3/ Includes roofing granules.

4/ Includes drain fields.

5/ Reported and estimated production without a breakdown by end use.

TABLE 4

OREGON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	385	1,760	639	2,660	W	W	9	46	W	W
Coarse aggregate, graded 3/	640	3,390	31	173	88	528	427	2,770	--	--
Fine aggregate (-3/8 inch) 4/	115	704	--	--	W	W	W	W	--	--
Coarse and fine aggregate 5/	6,570	34,600	2,800	15,000	665	3,720	W	W	W	W
Other construction materials 6/	--	--	66	302	--	--	--	--	--	--
Chemical and metallurgical 7/	--	--	--	--	--	--	W	W	--	--
Other miscellaneous uses	--	--	--	--	--	--	W	W	--	--
Unspecified: 8/										
Actual	1,970	9,700	62	273	--	--	186	821	1,620	7,510
Estimated	3,920	17,600	459	2,170	731	3,310	--	--	--	--
Total	13,600	67,700	4,060	20,600	1,500	7,670	2,180	13,500	1,890	8,610

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, roofing granules, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes drain fields.

7/ Includes cement manufacture.

8/ Reported and estimated production without a breakdown by end use.

TABLE 5
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	3,860	$21,300	$5.52
Plaster and gunite sands	5	55	11.00
Asphaltic concrete aggregates and other bituminous mixtures	1,590	9,550	6.01
Road base and coverings 2/	3,830	20,400	5.32
Fill	622	2,310	3.71
Snow and ice control	41	317	7.73
Other miscellaneous uses 3/	946	6,760	7.15
Unspecified: 4/			
Actual	4,130	20,300	4.91
Estimated	3,530	18,200	5.15
Total or average	18,600	99,200	5.34

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

2/ Includes road and other stabilization (cement).

3/ Includes railroad ballast.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
OREGON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		Unspecified districts 6/	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates 2/	3,020	13,000	701	7,300	W	W	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	1,020	5,780	520	3,140	W	W	W	W	--	--
Road base materials 3/	2,810	15,000	722	3,470	54	275	248	1,660	--	--
Fill	347	1,470	216	719	--	--	59	119	--	--
Other miscellaneous uses 4/	866	6,080	62	320	--	--	59	679	--	--
Unspecified 5/	6,290	34,600	199	736	220	938	235	1,050	717	1,190
Total	14,400	75,900	2,420	15,700	327	1,420	743	5,030	717	1,190

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

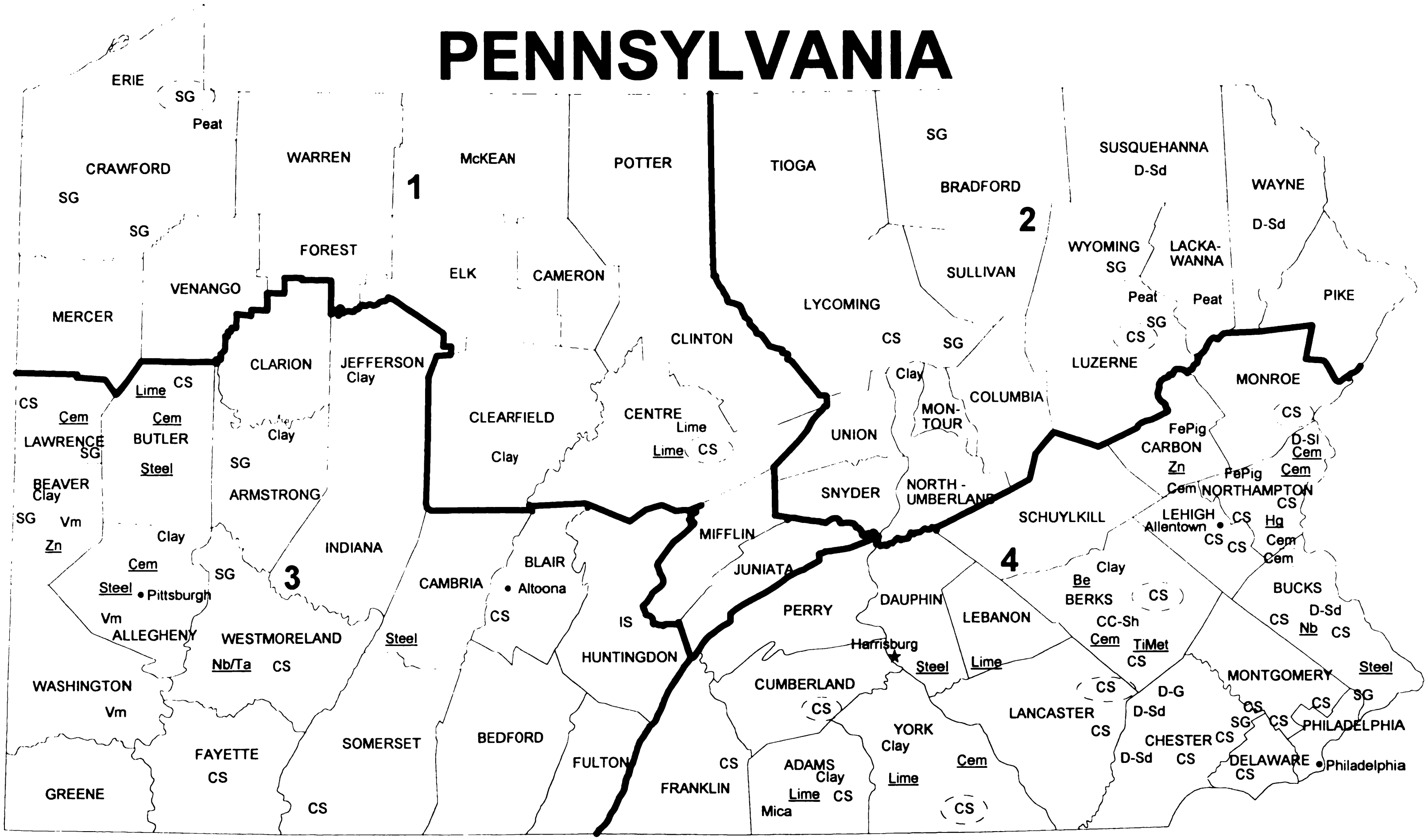
3/ Includes road and other stabilization (cement).

4/ Includes railroad ballast and snow and ice control.

5/ Reported production without a breakdown by end use.

6/ Includes production within the State with no district reported.

PENNSYLVANIA



LEGEND

───	County boundary
★	Capital
●	City
1 ━━━	Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Be	Beryllium plant	D-Sl	Dimension slate	Peat	Peat		
Cem	Cement plant	Hg	Mercury plant	SG	Construction sand and gravel		
Clay	Common clay	IS	Industrial sand	Steel	Steel plant		
CS	Crushed stone	Lime	Lime plant	TiMet	Titanium metal plant		
FePig	Iron oxide pigments	Mica	Mica	Vm	Vermiculite		
D-G	Dimension granite	Nb	Columbium plant	Zn	Zinc plant		
D-Sd	Dimension sandstone	Nb/Ta	Columbium/tantalum plant	( )	Concentration of mineral operations		

Source: Pennsylvania Bureau of Topographic and Geologic Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF PENNSYLVANIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Pennsylvania Bureau of Topographic and Geologic Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Pennsylvania was $1.28 billion, according to the U.S. Geological Survey (USGS). This was about a 4% increase from that of 1998,[2] and followed a 2.5% increase in 1998 from that of 1997. The State rose in rank to 10th from 11th in the Nation in nonfuel mineral production value, of which Pennsylvania accounted for more than 3% of the U.S. total.

Pennsylvania continued to be among the Nation's leading States that produce crushed stone, portland cement, lime, and masonry cement (by descending order of value); these four commodities accounted for more than 88% of the State's total nonfuel mineral production value. In 1999, crushed stone led the State's increase in value with a $33 million gain, followed by dimension stone, up about $12 million, and portland cement up $11 million. Lime production and value showed a relatively small decrease, down about $3 million. In 1998, increases in value of $37 million for portland cement and $27.5 million for construction sand and gravel more than balanced out decreases of $32 million for crushed stone and $5.2 million for lime, resulting in a $30 million gain for the year. Other changes in value for both years were small relative to these and inconsequential to the net result (table1).

Based upon USGS estimates of the quantities produced in the 50 States in 1999, Pennsylvania remained 2d in crushed stone, 3d in portland cement, 4th of 4 States that produce tripoli, 6th in masonry cement, 8th in dimension stone, and 10th in common clay. The State rose to fifth from sixth in lime. Additionally, significant quantities of construction and industrial sand and gravel were produced in the State (descending order of value).

Pennsylvania is exclusively an industrial mineral- and coal-producing State; metals that were produced in the State in 1999, especially steel, were processed from materials acquired from foreign and other domestic sources. Pennsylvania continued to be the Nation's third leading raw-steel-manufacturing State, with an estimated output of almost 7.6 million metric tons (Mt) of raw steel, as reported by the American Iron and Steel Institute.

The following narrative information was provided by the Pennsylvania Bureau of Topographic and Geologic Survey [3]. According to the Pennsylvania Department of Environmental Protection (DEP) and the USGS, industrial mineral production in Pennsylvania appears to be on a steady annual increase. Based upon statistics compiled by the DEP, this production increase averaged approximately 15% per year over the past 4 years. More than 1,400 hectares (ha) of new or expansion land for industrial mineral production (including topsoil, borrow and fill, and dimension stone) were sought in 1999. Undoubtedly, much of this activity can be related to the continued support of Federal highway funding known as TEA-21.

Preliminary estimates from the DEP indicate another extraordinary year for most construction-related mining activities, accounting for more than 140 Mt (including topsoil, borrow and fill, and dimension stone). Crushed stone production estimates made by the USGS for 1998 amount to nearly 95 Mt (a 6% increase over 1997). Carbonate rocks continue to dominate both the type of rock mined and the lowest unit value mined. They also comprised the most sought minerals.

More than 1,000 ha in new crushed stone production capacity was sought in 1999, according to DEP. Approximately 690 ha were sought in western Pennsylvania where subhorizontal Carboniferous sediments predominate, while nearly 320 ha were applied for in the folded Paleozoic rocks and more populated area of eastern Pennsylvania. Four operators choose nearly 160 ha of sandstone to either expand or start grass roots operations, while seven operators submitted permit applications for the mining of 850 ha of carbonate rocks. Of note were a new high-friction sandstone source near the central portion of the State and a large underground limestone expansion in the western portion of the State.

The consolidation of the cement quarries in western Pennsylvania continues where thin layers of limestone are interspersed with coal, sandstone, and mudstone. Western Pennsylvania was also the focus of industry buyouts, with at least five carbonate properties changing hands; the most notable was the purchase of Commercial Stone Co., Inc. for an undisclosed sum by Better Minerals and Aggregates Co., formerly U.S. Silica Co.

According to the USGS, in 1998 sand and gravel production in the State increased 22% to over 19 Mt. However, sand and gravel exploration activity was confined to six operators in western Pennsylvania seeking more than 81 ha of new production, mostly in the glaciated northwestern portion of the State. Because most glacially derived sand and gravel deposits in Pennsylvania are confined to the less populated northwestern and northeastern portions of the State, manufactured sand from crushed stone helps to alleviate a sand and gravel shortage in the most populated southeastern portion of the State. Five sand and gravel operations representing nearly 360 ha changed ownership, the most significant was a 240-ha property in western Pennsylvania.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Samuel W. Berkheiser, Jr., Chief, Geological Resources Division, authored the text of State mineral industry information submitted by the Pennsylvania Bureau of Topographic and Geologic Survey.

If limestone is the rock of choice for the crushed stone industry, then sandstone is the rock of choice for the building stone/dimension stone industry in the Commonwealth. Sixty-one new, 2 ha or less, dimension stone quarries submitted surface mining applications to DEP. Every application was for quarrying sandstone. The robust "bluestone/flagstone" industry in the northeastern corner of the State continues to expand and become more compliant with DEP; 49 operations sought mining permits. The other 12 mining applications represented colluvium and thicker bedrock sandstone opportunities, four were in the more densely populated eastern portion of the State.

The brick industry expanded its potential reserves by seeking two new clay/shale mining permits totaling about 100 ha. Landfill cover is also in demand as witnessed by the application to mine about 30 ha of shale in northwestern Pennsylvania by a single operator. New topsoil sources, used mainly for commercial agricultural blends with peat and sand, accounted for about 36 ha being sought by 11 operators. Most topsoil operations mine fine loam and silt in floodplain settings.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN PENNSYLVANIA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	296	31,000 e/	319	31,000 e/	327	32,000 e/
Portland	6,360	420,000 e/	6,740	457,000 e/	6,900	468,000 e/
Clays: Common	839	2,740	886	2,270	891	2,210
Gemstones	NA	1	NA	1	NA	1
Lime	1,510	103,000	1,390	97,800	1,350	94,700
Peat	3	126	6	154	7	262
Sand and gravel: Construction	15,700	88,500	19,200	116,000	18,700	116,000
Stone:						
Crushed	89,200	536,000	94,500	504,000	98,000	537,000
Dimension metric tons	53,900	10,800	45,200	9,480	44,600	21,600
Combined values of clays (kaolin), sand and gravel (industrial), tripoli	XX	10,700	XX	11,800	XX	11,800
Total	XX	1,200,000	XX	1,230,000	XX	1,280,000

e/ Estimated. p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
PENNSYLVANIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	122 r/	53,600 r/	$313,000 r/	$5.85	125	54,300	$303,000	$5.58
Dolomite	18 r/	12,600 r/	78,100 r/	6.18	19	17,500	82,900	4.74
Granite	7	4,210	28,500	6.76	7	3,710	19,000	5.11
Marble	1	390	2,370	6.07	1	W	W	6.01
Sandstone and quartzite	34 r/	5,990	35,400	5.90	37	7,100	37,800	5.32
Traprock	9	2,970	22,600	7.62	9	3,160	15,400	4.88
Slate	--	--	--	--	1	W	W	5.56
Miscellaneous stone	19	9,390	55,900	5.95	21	8,200	43,400	5.29
Total or average	XX	89,200	536,000	6.01	XX	94,500	504,000	5.34

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	421	$2,810	$6.68
Riprap and jetty stone	765	5,470	7.15
Filter stone	256	1,250	4.87
Other coarse aggregate	372	2,300	6.18
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,060	17,000	5.56
Bituminous aggregate, coarse	6,240	36,000	5.77
Bituminous surface-treatment aggregate	1,690	10,200	6.01
Railroad ballast	761	4,300	5.64
Other graded coarse aggregate	3,160	13,600	4.30
Fine aggregate (-3/8 inch):			
Stone sand, concrete	275	1,420	5.17
Stone sand, bituminous mix or seal	2,460	14,100	5.74
Screening, undesignated	1,330	5,790	4.34
Other fine aggregate	581	2,780	4.79
Coarse and fine aggregates:			
Graded road base or subbase	8,800	41,900	4.76
Unpaved road surfacing	1,720	8,240	4.78
Terrazzo and exposed aggregate	176	818	4.65
Crusher run or fill or waste	1,410	6,070	4.32
Other coarse and fine aggregates	6,050	25,700	4.25
Other construction materials	1,460	8,130	5.56
Agricultural: Agricultural limestone	395	2,300	5.82
Chemical and metallurgical:			
Cement manufacture	6,940	32,700	4.70
Lime manufacture	W	W	4.96
Dead-burned dolomite manufacture	W	W	3.34
Flux stone	126	518	4.11
Sulfur oxide removal	407	3,440	8.44
Special:			
Mine dusting or acid water treatment	W	W	15.31
Asphalt fillers or extenders	666	4,960	7.44
Whiting or whiting substitute	177	6,020	34.02
Other fillers or extenders	220	2,170	9.84
Roofing granules	438	1,450	3.31
Other miscellaneous uses: Other specified uses not listed	423	3,790	8.96
Unspecified: 3/			
Actual	29,700	163,000	5.49
Estimated	13,500	73,400	5.45
Total or average	94,500	504,000	5.34

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, quartzite, sandstone, slate, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
PENNSYLVANIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:										
Coarse aggregate (+1 1/2 inch) 2/	3	22	231	1220	859	5,760	721	4820	--	--
Coarse aggregate, graded 3/	77	620	W	W	5,210	33,400	8,950	43,600	W	W
Fine aggregate (-3/8 inch) 4/	36	292	347	1,630	1,130	6,340	3,140	15,800	--	--
Coarse and fine aggregate 5/	58	467	1,580	6,800	W	W	12,400	52,900	W	W
Other construction materials	--	--	W	W	448	2,550	W	W	--	--
Agricultural 6/	--	--	W	W	45	686	W	W	--	--
Chemical and metallurgical 7/	--	--	144	1,820	1,330	9,000	6,470	28,100	--	--
Special 8/	--	--	127	1,050	W	W	W	W	--	--
Other miscellaneous use	--	--	--	--	W	W	W	W	--	--
Unspecified: 9/										
Actual	1,860	10,300	3,710	20,500	3,770	20,400	20,400	112,000	--	--
Estimated	2,100	11,900	1,620	8,380	1,760	9,800	7,990	43,300	--	--
Total	4,140	23,600	8,480	45,300	19,400	115,000	62,500	320,000	15	90

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone.

7/ Includes cement manufacture, dead-burned dolomite manufacture, flux stone, lime manufacture, and sulfur oxide removal.

8/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, roofing granules, whiting or whiting substitute, and other fillers or extenders.

9/ Reported and estimated production without a breakdown by end use.

TABLE 5
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	3,940	$27,000	$6.85
Plaster and gunite sands	25	289	11.56
Concrete products (blocks, bricks, pipe, decorative, etc.)	834	5,760	6.91
Asphaltic concrete aggregates and other bituminous mixtures	2,250	12,100	5.40
Road base and coverings 2/	1,350	7,190	5.33
Fill	629	2,590	4.11
Snow and ice control	202	980	4.85
Railroad ballast	5	45	9.00
Other miscellaneous uses 3/	990	4,890	4.94
Unspecified: 4/			
Actual	3,850	26,400	6.84
Estimated	5,150	29,200	5.67
Total or average	19,200	116,000	6.06

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes road and other stabilizations (lime).

3/ Includes filtration and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
PENNSYLVANIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate	890	5,060	893	5,740	907	6,860	1,250	9,340
Concrete products 2/	W	W	95	1,010	482	2,810	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	408	2,180	875	4,650	W	W
Road base and coverings 3/	719	3,880	324	1,550	232	1,250	76	506
Fill	77	274	161	632	360	1,510	31	175
Snow and ice control	108	452	W	W	W	W	15	91
Other miscellaneous uses 4/	227	1,290	16	106	136	995	615	2,550
Unspecified: 5/								
Actual	903	5,860	W	W	W	W	459	2,130
Estimated	1,310	6,140	1,270	7,120	2,310	13,500	265	2,420
Total	5,280	28,800	3,700	22,800	7,330	45,900	2,920	18,900

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

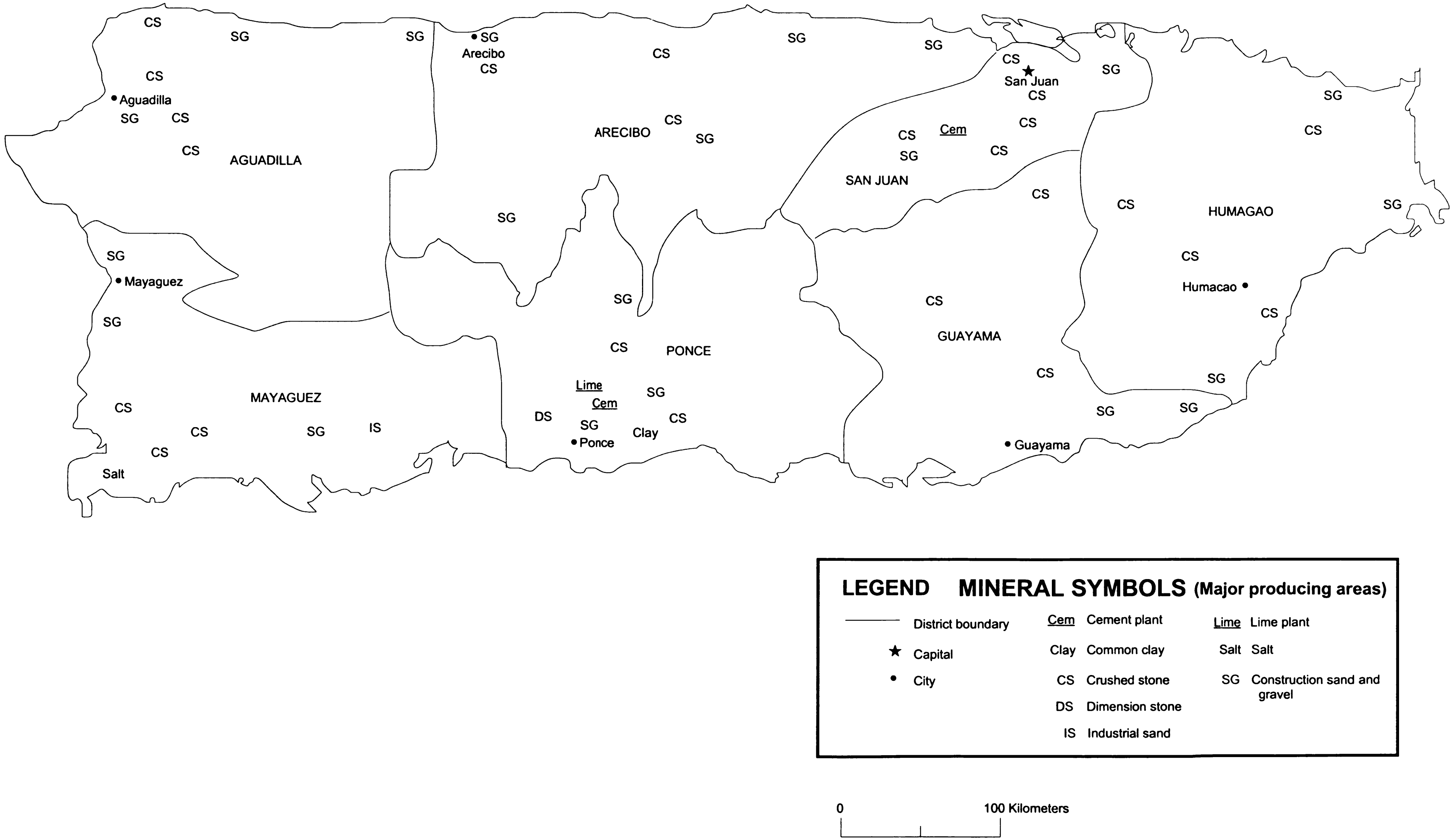
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilizations (lime).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

PUERTO RICO



Source: Department of Natural Resources, Commonwealth of Puerto Rico/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF PUERTO RICO AND THE ADMINISTERED ISLANDS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Department of Natural Resources, Bureau of Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Puerto Rico[2] was $165 million, according to the U.S. Geological Survey (USGS). If ranked in comparison with the 50 States, Puerto Rico would rank 42d in total nonfuel mineral production value. Portland cement, by value, was the Commonwealth's leading nonfuel mineral commodity. Crushed stone for many years has been the second-leading mineral, and most likely continues as such, but the USGS has no comprehensive data owing to a low response rate to its crushed stone canvasses. Therefore, no preliminary estimate has been made for 1999. Construction sand and gravel is produced in Puerto Rico, but production data are not available. The collection and compilation of production data for construction sand and gravel were discontinued in 1973 by the U.S. Bureau of Mines (the Federal Government agency then responsible for collecting domestic raw nonfuel mineral production data) because of a low rate of response to surveys by the industry (Sikich and Alonso, 1993, p. 469). The data for dimension stone, as well as for industrial sand and gravel, were withheld to protect company proprietary data.

Metals have not been mined in Puerto Rico since the Juncos iron mine closed in 1953; prospects for resuming metal mining in the near future do not appear to be likely. However, metal occurrences are common on the island and the possibility of developing a metal deposit should not be completely discounted (Sikich and Alonso, 1993).

Of the U.S. Administered Islands, Guam is the only one from which nonfuel mineral production has been reported and this has been limited to crushed stone. Owing to a low response rate, no preliminary data are available for 1999.

Reference Cited

Sikich, S.W., and Alonso, R.M., 1993, The mineral industries of Puerto Rico, Northern Marianas, Island Possessions, and Trust Territory: U.S. Bureau of Mines Minerals Yearbook 1992, v. II, p. 467- 470.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN THE COMMONWEALTH OF PUERTO RICO
AND ISLANDS ADMINISTERED BY THE UNITED STATES 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Puerto Rico:						
Cement: Portland metric tons	W	(3/)	1,590	W	1,630	W
Clays: Common	W	363	W	W	W	W
Lime	32	4,580	37	4,800	35	4,530
Salt	45	1,500	45	1,500	45	1,500
Stone: Crushed	14,000	71,300	12,700	58,600	NA	NA
Combined value of other industrial minerals	XX	(3/)	XX	156,000	XX	159,000
Total	XX	77,700 4/	XX	221,000	XX	165,000
Administered Islands:						
Guam: Stone: Crushed	1,760	10,500	1,850	14,100	NA	NA

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data.

4/ Total does not include value of items withheld.

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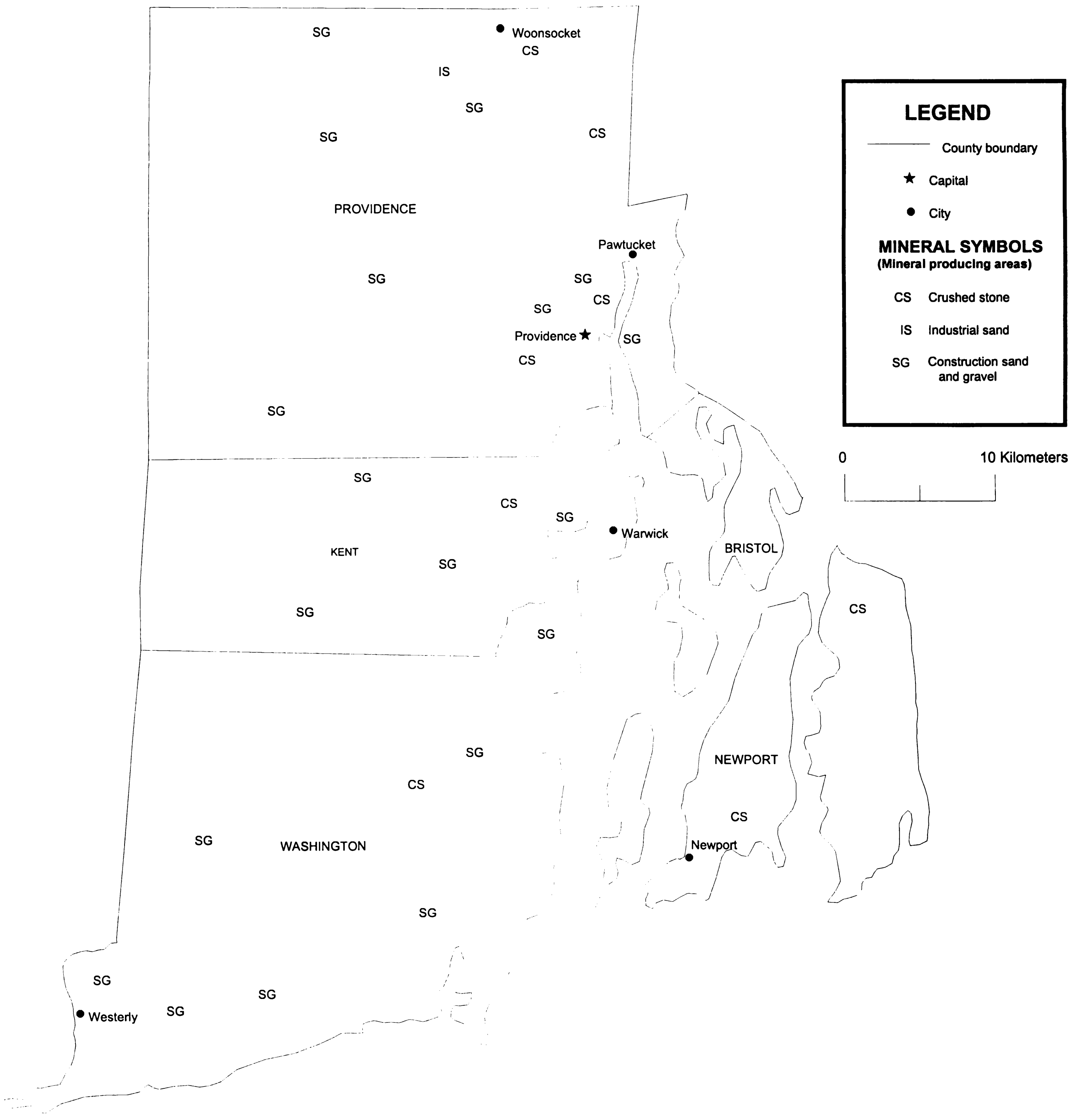
[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] While a memorandum of understanding (MOU) was officially made between the U.S. Geological Survey (USGS) and the Commonwealth of Puerto Rico, MOU's were not established with the Commonwealth of the Northern Mariana Islands, U.S. Caribbean and Pacific Island Possessions, or the U.S. Trust Territory of the Pacific Islands. Nevertheless, data on nonfuel mineral production were reported to the USGS for the island of Guam of the Pacific Island Possessions. These data appear in table 1.

RHODE ISLAND



Source: University of Rhode Island Department of Geology, Office of the State Geologist/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF RHODE ISLAND

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Rhode Island Department of Geology, Office of the State Geologist, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Rhode Island was $25.4 million, according to the U.S. Geological Survey. This was nearly equal to that of 1998,[2] and followed a 7% decrease in value from 1997 to 1998. In 1999, the State's marginal increase resulted from a rise in the production and value of crushed stone, slightly offsetting the decrease in the value of construction sand and gravel. No change occurred in the value of either gemstones or industrial sand and gravel; data for the latter were withheld from Table 1 to avoid disclosing company proprietary information. In 1998, crushed stone production and value increased. Its value rose by $2.7 million, but decreases in construction sand and gravel production and value were greater, resulting in a net decrease for the year (table 1). There was a small increase in the value of industrial sand and gravel.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN RHODE ISLAND 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	1,960	15,700	1,390	11,100	1,110	9,080
Stone: Crushed	1,830	11,500	2,240	14,200	2,500	16,300
Total 3/	XX	27,200	XX	25,300	XX	25,400

p/ Preliminary. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Partial total; excludes value of sand and gravel (industrial) that must be concealed to avoid disclosing company proprietary data.

TABLE 2
RHODE ISLAND: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1	W	W	W	1	W	W	W
Granite	5	1,300	$8,210	$6.31	6	1,610	$10,500	$6.48
Traprock	2	W	W	W	2	W	W	W
Total or average	XX	1,830	11,500	6.30	XX	2,240	14,200	6.35

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
RHODE ISLAND: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	11	$88	$7.97
Filter stone	16	125	7.79
Coarse aggregate, graded:			
Concrete aggregate, coarse	27	278	10.28
Bituminous aggregate, coarse	155	1,490	9.63
Bituminous surface-treatment aggregate	79	434	5.50
Fine aggregate (-3/8 inch):			
Stone sand, concrete	59	348	5.91
Stone sand, bituminous mix or seal	136	975	7.17
Screening, undesignated	22	87	3.94
Coarse and fine aggregates:			
Graded road base or subbase	102	422	4.14
Unpaved road surfacing	5	36	7.25
Crusher run or fill or waste	W	W	7.65
Agricultural limestone	W	W	3.19
Other miscellaneous uses: Other specified uses not listed	W	W	3.77
Unspecified: 3/			
Actual	838	5,190	6.20
Estimated	774	4,680	6.05
Total or average	2,240	14,200	6.35

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes granite, limestone, and traprock.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
RHODE ISLAND: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products 3/	463	$3,680	$7.94
Asphaltic concrete aggregates and road base materials 4/	247	2,460	9.98
Fill	64	400	6.25
Snow and ice control	8	82	10.25
Railroad ballast	W	W	W
Unspecified: 5/			
Actual	W	W	W
Estimated	303	1,830	6.03
Total or average	1,390	11,100	7.99

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ To avoid disclosing company proprietary data, no district tables were produced in 1998.

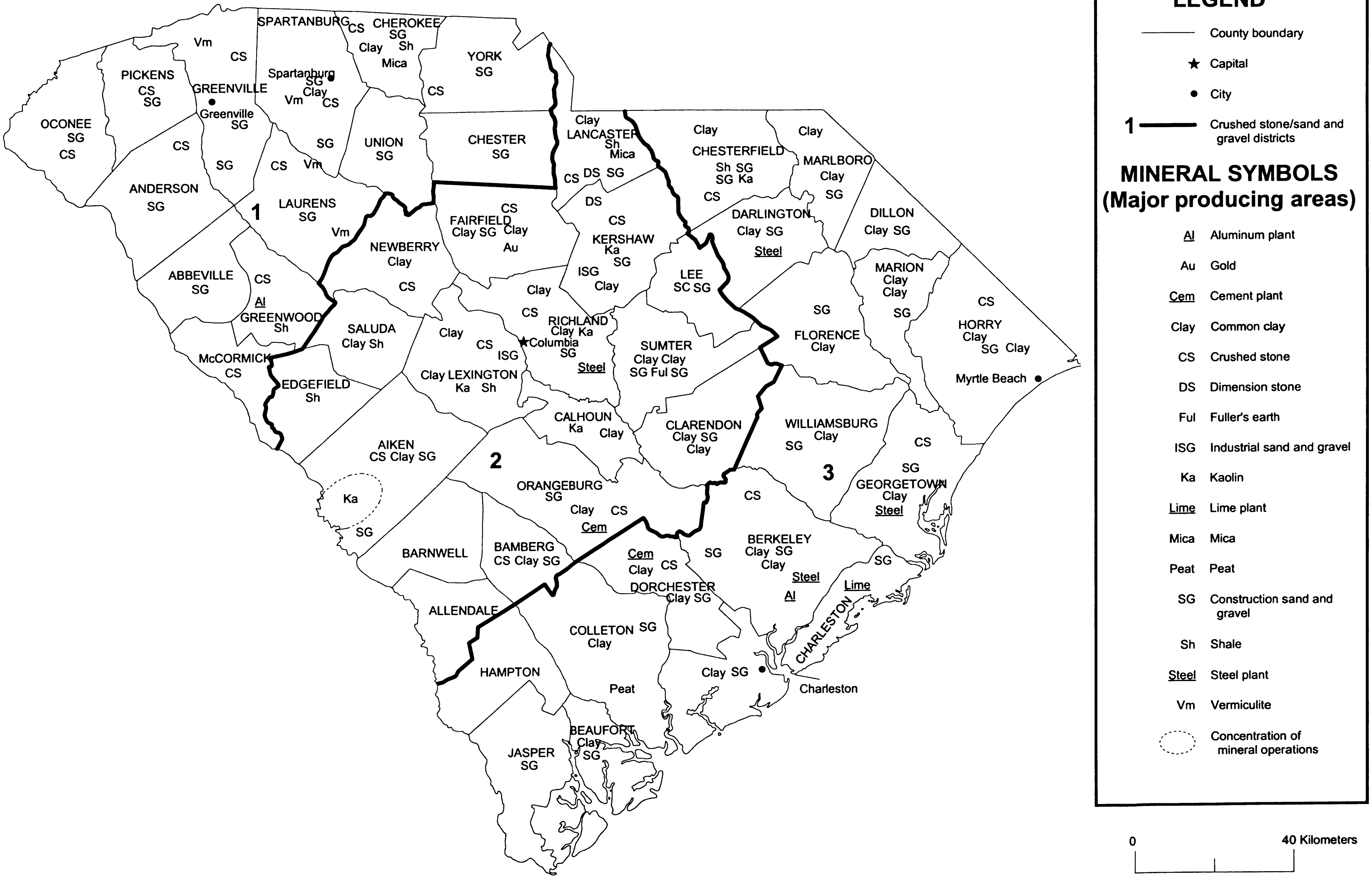
2/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

3/ Includes plaster and gunite sands.

4/ Includes road and other stabilization (cement).

5/ Reported and estimated production without a breakdown by end use.

SOUTH CAROLINA



Source: South Carolina Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF SOUTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Carolina Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for South Carolina was $574 million, according to the U.S. Geological Survey (USGS). This was a 2% increase from that of 1998,[2] and followed a 1% decrease in 1998 from that of 1997. The State remained 24th among the 50 States in total nonfuel mineral production value, of which South Carolina accounted for nearly 1.5% of the U.S. total.

The State's increase in value was led by a $13 million increase in the value of crushed stone and a $6 million increase in portland cement. Smaller yet significant increases also occurred in construction sand and gravel, kaolin, and masonry cement (listings in descending order of change) (table 1). The largest decrease was a $9.3 million drop in the value of industrial sand and gravel, followed by smaller drops in the values of gold and vermiculite; common clays was also down, slightly. In 1998, the values of portland and masonry cements, construction sand and gravel increased significantly, while industrial sand and gravel, common clays, and vermiculite experienced smaller gains. These increases were more than balanced out by the decreased values of crushed stone, gold (down more than $11 million), and kaolin, resulting in a net decrease for the year (table 1).

Based upon USGS estimates of the quantities produced in the 50 States in 1999, South Carolina remained 1st of 2 States that produce vermiculite, 2d in kaolin, 3d in fire clays, 4th in masonry cement and mica, 6th in common clays, and 10th in portland cement and gold (listings in descending order of value). Additionally, significant quantities of crushed stone and industrial sand and gravel were produced in South Carolina. Primary aluminum and raw steel also were produced in the State but from raw materials that were acquired from other domestic and foreign sources. South Carolina remained seventh of 14 States in the production of primary aluminum in 1999.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

NONFUEL RAW MINERAL PRODUCTION IN SOUTH CAROLINA 1/ 2/

(Thousand metric tons and thousand dollars)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	334	35,500 e/	374	43,700 e/	384	45,000 e/
Portland	2,520	194,000 e/	2,640	210,000 e/	2,710	216,000 e/
Clays:						
Common	1,080	2,850	1,220	3,950	1,220	3,850
Fire	--	--	36	38	36	38
Kaolin	447	29,000	395	22,000	406	23,400
Gemstones	NA	1	NA	1	NA	1
Sand and gravel:						
Construction	8,130	30,400	9,690	35,900	10,100	38,300
Industrial	770	19,300	881	20,700	692	11,400
Stone:						
Crushed	25,900	202,000	28,000	182,000	29,200	195,000
Dimension	W	W	12,900	1,150	11,700	1,150
Combined values of gold, lime (1999), manganiferous ore (1997), mica (crude), silver, stone [dimension granite (1997)], vermiculite	XX	54,200	XX	42,600	XX	40,500
Total	XX	567,000	XX	562,000	XX	574,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable. -- Zero.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	1 r/	3,100 r/	$30,400 r/	$9.80 r/	8	3,660	$26,200	$7.17
Granite	25	19,000	157,000	8.27	26	20,400	137,000	6.71
Marble	1	W	W	W	1	W	W	W
Calcareous marl	3 r/	W	W	W	6	W	W	W
Total or average	XX	25,900	202,000	7.79	XX	28,000	182,000	6.50

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	38	$294	$7.74
Riprap and jetty stone	180	1,820	10.12
Filter stone	W	W	9.65
Other coarse aggregate	1,770	6,670	3.77
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,260	11,000	8.68
Bituminous aggregate, coarse	W	W	8.10
Bituminous surface-treatment aggregate	W	W	W
Railroad ballast	W	W	8.07
Other graded coarse aggregate	4,840	33,300	6.87
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.87
Stone sand, bituminous mix or seal	W	W	6.79
Screening, undesignated	360	3,210	8.92
Other fine aggregate	1,420	7,750	5.46
Coarse and fine aggregates:			
Graded road base or subbase	868	7,150	8.24
Crusher run or fill or waste	W	W	5.78
Other coarse and fine aggregates	2,160	12,400	5.74
Chemical and metallurgical: Cement manufacture	(3/)	(3/)	4.09
Special: Roofing granules	(3/)	(3/)	5.77
Unspecified: 4/			
Actual	11,500	82,400	7.16
Estimated	383	2,750	7.17
Total or average	28,000	182,000	6.50

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes calcareous marl, granite, limestone, and marble.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
SOUTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	659	4,100	W	W	W	W
Coarse aggregate, graded 3/	3,670	28,400	W	W	W	W
Fine aggregate (-3/8 inch) 4/	W	W	W	W	W	W
Coarse and fine aggregate 5/	W	W	--	--	W	W
Chemical and metallurgical 6/	--	--	W	W	W	W
Unspecified: 7/						
Actual	3,380	24,200	3,740	26,800	4,390	31,400
Estimated	136	975	123	884	124	889
Total	11,500	78,900	8,950	48,000	7,500	54,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (bituminous mix or seal), stone sand (concrete), screening (undesignated), and other fine aggregates.

5/ Includes crusher run (select material or fill), graded road base or subbase, roofing granules, and other coarse and fine aggregates.

6/ Includes cement manufacture.

7/ Reported and estimated production without a breakdown by end use.

TABLE 5
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	4,100	$14,800	$3.61
Plaster and gunite sands	54	360	6.67
Concrete products (blocks, bricks, pipe, decorative, etc.)	265	736	2.78
Asphaltic concrete aggregates and other bituminous mixtures	102	317	3.11
Road base and coverings 2/	73	267	3.66
Fill	1,080	1,640	1.53
Snow and ice control	7	24	3.43
Other miscellaneous uses	6	26	4.33
Unspecified: 3/			
Actual	2,380	11,200	4.71
Estimated	1,620	6,470	3.99
Total or average	9,690	35,900	3.70

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	W	W	2,940	11,100
Asphaltic concrete and road base materials 3/	51	200	W	W	W	W
Fill	36	149	132	219	906	1,270
Other miscellaneous uses 4/	W	W	--	--	W	W
Unspecified 5/	103	594	1,050	4,950	2,850	12,100
Total	445	1,950	2,480	9,200	6,770	24,700

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

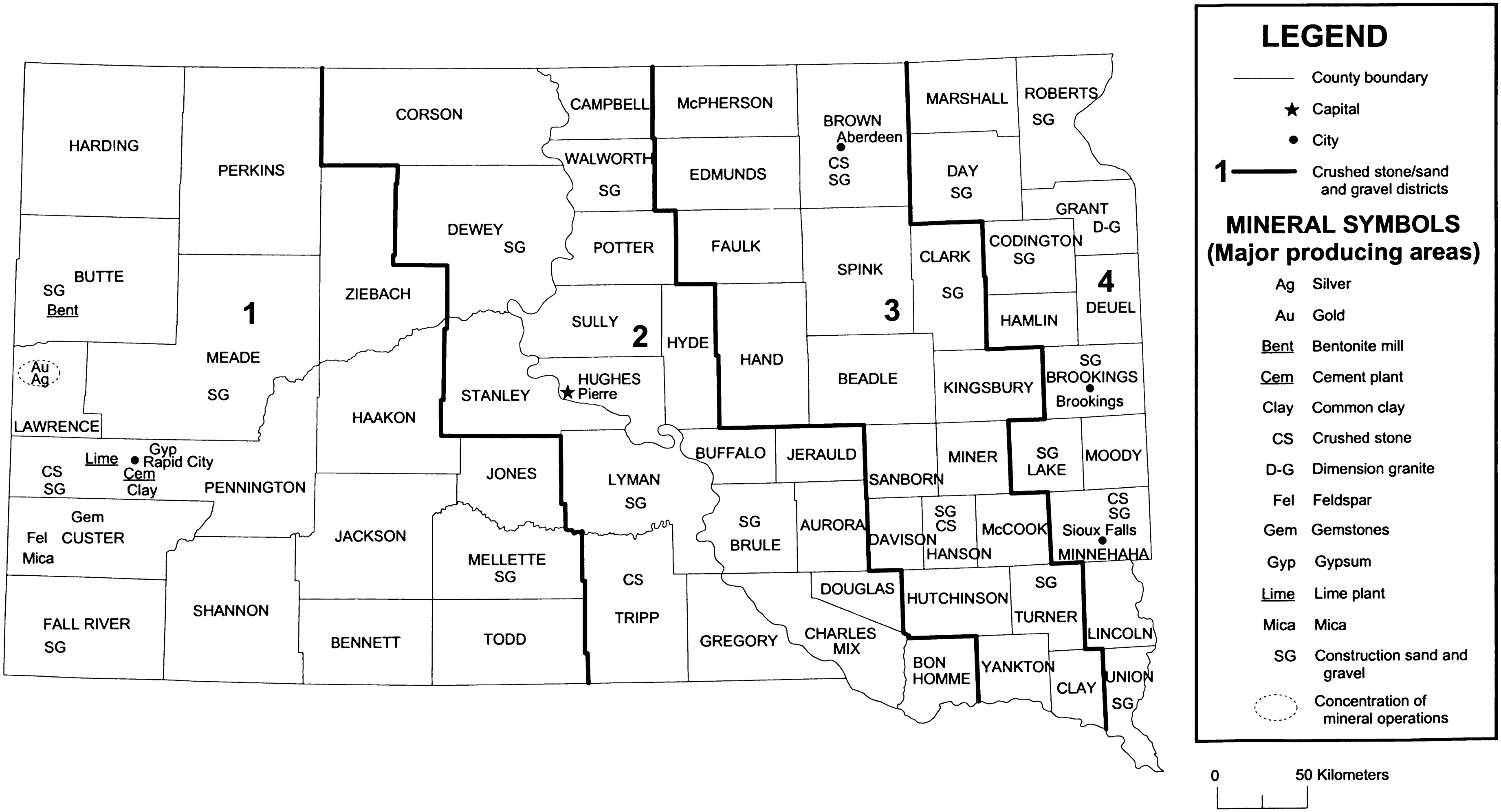
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes snow and ice control.

5/ Reported production without a breakdown by end use.

SOUTH DAKOTA



Source: South Dakota Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF SOUTH DAKOTA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the South Dakota Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for South Dakota was $226 million, according to the U.S. Geological Survey (USGS). This was a 12% decrease from that of 1998,[2] and followed a 21.3% decrease from 1997 to 1998.

Gold remained South Dakota's leading nonfuel mineral by value, accounting for about 39% of the State's total nonfuel mineral production value. In 1999, decreases in the values of gold, construction sand and gravel, and granite dimension stone (descending order of change) accounted for most of the State's drop in value. Relatively small decreases also occurred for crushed stone, iron ore, and common clays. Portland cement, lime, and mica showed increases of $1 million or less. In 1998, construction sand and gravel had the only significant increase in value, up about $1.5 million. The decreased values of gold, crushed stone, and portland cement accounted for most of the decrease in the State's mineral value for the year (table 1).

Based upon USGS estimates of the quantities produced in the 50 States during 1999, South Dakota remained fifth in gold and mica and seventh in feldspar. Additionally, South Dakota was the second-leading State in the production of granite dimension stone.

The following narrative information was provided by the South Dakota Department of Environment and Natural Resources' (DENR) Minerals and Mining Program[3] (MMP) in association with DENR's South Dakota Geological Survey (SDGS). Production data in the text that follows are those reported by the MMP based upon the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

Gold production continued to decline in South Dakota in 1999. The gold mines in the northern Black Hills produced 9,962 kilograms (kg) of gold in 1999. This represented an 18% drop in the amount of gold produced in 1998, but gold continued to remain the leading mineral commodity in South Dakota in terms of value. The average price of gold in 1999 was about $279 per troy ounce, yielding a gross value of about $89 million. While the amount of gold produced in 1999 dropped by 18% from the previous year, the lower gold price caused a 22% drop in gross value. The mines are surface heap leach operations with the exception of Homestake Mining Co.

Production from the Homestake Open Cut decreased from 4,975 kg in 1998 to 790 kg in 1999. The reason for the decrease is that Homestake completed mining in the Open Cut in September 1998, and the only production in 1999 came from stockpiled ore. Meanwhile, production increased in Homestake's underground mine from 3,653 kg in 1998 to 5,825 kg in 1999. This was due to Homestake instituting its new underground mining plan.

Wharf Resources (USA), Inc. and Brohm Mining Corp. were the only other companies to report gold production in 1999. Wharf reported gold production of 3,335 kg in 1999, a slight decrease from the 3,427 kg reported in 1998. Brohm produced only 11 kg in 1999, which were recovered from residual gold in process solutions early in the year.

Brohm, Homestake, and Wharf also produced silver as a byproduct in the gold recovery process. A total of 2,045 kg of silver was recovered in 1999. At an average price of $5.22 per ounce, the value of the silver was $343,000. This was a decrease from the 2,818 kg and $501,974 value reported in 1998.

The Golden Reward Mine remained under temporary cessation and produced no gold. LAC Minerals' Richmond Hill Mine was no longer producing gold and the mine was undergoing final reclamation.

Twelve mine permits covered 7 large-scale gold mining operations in the State. No new mine permits or mine permit amendments were issued to large-scale gold operations in 1999.

During the 1999 reporting period, 491 companies had active mine licenses in South Dakota. Operators were required to obtain a license to mine for sand, gravel, pegmatite minerals, materials used in the process of making cement or lime, and rock to be crushed and used in construction. There were also 40 mine permits that covered the mining of other minerals, such as slate, bentonite, placer gold, and dimension stone.

Sand and gravel was the major nonmetallic industrial mineral commodity produced with 13.3 million metric tons (Mt) reported removed. Sand and gravel was produced in nearly every county in South Dakota and was used mainly for road construction projects.

The second largest nonmetallic mineral commodity produced in 1999 was limestone with 3.4 Mt tons produced. The South Dakota Cement Plant of Rapid City alone produced 1.1 Mt of limestone. It also produced 183,000 metric tons (t) of shale, 48,000 t of gypsum, and 33,488 t of sand.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] E.H Holm, D.K. Burtts, M.R. Nelson., and Erik Nelson of the DENR's Minerals and Mining Program jointly authored the text of mineral industry information used in the remainder of this publication.

Sioux quartzite was the third largest nonmetallic industrial mineral commodity produced with 2.6 Mt reported removed. It was quarried from four locations in southeastern South Dakota. Most of the quartzite was crushed and used in construction. Some larger blocks were used for rip-rap, railroad ballast, and occasionally for decorative purposes.

Granite was mined by Dakota Granite Co. and Cold Spring Granite Co. from quarries near Milbank, SD. Due to its beauty and distinctive red color, the mahogany granite was used primarily for floor tiles, monuments, and building construction. Much of it went to international markets. Other industrial minerals produced in lesser amounts in 1999 included bentonite, iron ore, mica schist, pegmatite minerals (feldspar, mica, rose quartz), placer gold, and slate.

Exploration activities in the State slowed in 1999, primarily due to lower gold prices. Two exploration permits were granted during the year. Wharf Resources permitted 1,454 drill holes and completed 125 reverse circulation and diamond core drill holes in the vicinity of its existing operations in Lawrence County. Wharf was exploiting disseminated epithermal gold deposits in the Bald Mountain mining district. Exploration drilling in Wharf's American Eagle area reportedly increased Wharf's gold reserves by 1,900 kg to 32,000 kg. Homestake Mining Co. continued operations at its underground mine in Lead throughout 1999, but completed no surface exploration activities. Apex Minerals Inc. received an exploration permit in Custer County to explore for placer gold and associated detrital heavy minerals in Oligocene terrace gravel deposits. The Apex permit involved trenching and channel sampling, followed by sample analysis at its facility in Newell, SD. Currently, 113 exploration permits remain active in South Dakota primarily for gold and silver exploration within the northern Black Hills.

In the early part of the year, Dakota Mining Corp. (Brohm's parent corporation) was hopeful that it could still mine phase 2 of the Anchor Hill Mine sometime in 1999. The corporation was in the process of settling a lawsuit with environmental groups and was working with the U.S. Forest Service (USFS) to submit an operating plan. However, because of the drop in gold prices and delays in obtaining USFS approval for phase 2, Dakota's creditors would not continue to finance the mining operation. As a result, Dakota filed for bankruptcy in Canada in July 1999. The bankruptcy was filed just days before the settlement agreement was reached with the environmental groups.

Due to the bankruptcy and environmental problems at the site, the State intervened. The first State action taken was to prevent the discharge of acid water from the Gilt Edge Mine. The Gilt Edge Mine, owned by Dakota, has been shut down since 1997. The Governor authorized payment of funds for water treatment from the State's Regulated Substance Response Fund. By doing this, the State did not use the reclamation bond to pay for water treatment, thus preserving it for actual reclamation work. The water treatment plant was brought back into operation on July 27, 1999, and continued operating throughout the remainder of 1999. Since July, Brohm personnel have been working with the DENR to successfully treat acid water at the site. The volume of acid water was reduced from about 570 million liters (ML) in July to 488 ML by December. There is now enough room at the site to collect and store acid drainage from a 100-year storm event.

The U.S. Bureau of Reclamation, through an interagency agreement with the U.S. Environmental Protection Agency, (EPA), prepared a site closure plan. In general, the plan for the Gilt Edge Mine is to:

1. Partially remove the Ruby waste rock dump as pit backfill;
2. cap and revegetate the remainder of the Ruby waste rock dump in place;
3. seal historic underground mine workings;
4. partially backfill the mine pits;
5. cap the mine pits, as necessary; and
6. remove spent ore from the leach pad for pit backfill and cap construction.

When acid mine drainage was discovered at the mine in 1993, Brohm did not have money to increase its reclamation bond to cover the costs of acid mine drainage mitigation. The State negotiated an agreement with Brohm to provide an additional $1 million in cash to add to the bond and a promissory note. While Brohm was complying with a State order to mitigate the acid mine drainage at the mine, it developed a mine plan for a new gold deposit near the existing mine called the Anchor Hill project. Brohm proposed to use the cash flow and the low sulfide rock from this project to concurrently cap and reclaim the acid producing areas of the mine. The State granted a permit for this project in 1996, but with the following conditions to increase the cash portion of the reclamation bond:

1. Brohm had to deposit cash bonds with the State before any new areas were disturbed;
2. Brohm had to leave all interest from the bond in a State account; and
3. Brohm had to deposit 1% of gross gold sales into a State account.

Before Dakota Mining's bankruptcy, Brohm complied with the permit conditions and made progress in increasing the cash portion of the reclamation bond to over $6 million by mining Phase I of the Anchor Hill project. However, after the bankruptcy, Brohm had no more money to add to the cash bond. After reviewing cost estimates to close the mine, it was clear there would be a shortfall in reclamation funding due to the promissory note not being met.

During the 2000 legislative session, the Governor introduced several measures to the legislature to obtain funding to make up the shortfall in reclamation funding. He asked the legislature to use $8 million of tobacco settlement money to make up the shortfall. However, the legislature did not want to use tobacco settlement money for mine reclamation. The Governor then introduced a bill that would require the other mining companies to act as emergency response contractors and to indemnify them as agents of the State. Because of mining industry opposition, the bill did not pass. Finally, the Governor proposed a bill to increase the severance tax on gold, with the money going into a reclamation fund. This bill also was not approved.

With no other legislative options available, the Governor had no choice but to ask the EPA to place the mine site on the Superfund National Priority List. The State is currently working with the EPA to have the site listed and to begin reclamation work sometime in the summer of 2001.

With regard to reclamation efforts at the Richmond Hill Mine, the pit impoundment, backfilled with acid-generating rock and covered with a low-permeability capping system, continued to exceed expectations in 1999. Four seasons of monitoring data show that only minimum amounts of oxygen and water were being detected in the impoundment. This indicates the cap was effective in limiting oxygen and water infiltration and was preventing acid generation. No signs of settling or slumping were found during several inspections of the pit impoundment. Only minor erosion was noted on a few portions of the impoundment. A dense, self-sustaining vegetative cover was becoming established on the pit impoundment and waste dump area.

The capped leach pads were also performing well. No signs of settling or slumping were found on the leach pads. Only minor erosion was noted in several areas. A good vegetative cover was becoming established. Monitoring data showed that the capping systems were effective in reducing water infiltration into the spent ore. Because of the low metal concentrations in the pad effluent, LAC thinks that passive treatment may be feasible for long-term water treatment. A pilot plant has been constructed to test passive treatment, and test results are encouraging so far.

Ground and surface water quality around the mine site continued to improve. Biological assessments of Squaw Creek below the mine showed that the stream was healthy. At the end of 1999, LAC discontinued water treatment for the winter because the volume of water requiring treatment had been reduced to minimal levels. Only seasonal water treatment will be conducted, starting in the summer of 2000. Because of decreased water treatment and reclamation requirements at the site, LAC reduced its workforce to three employees at yearend.

The DENR continued working with the USFS, the U.S. Bureau of Land Management (BLM), and the EPA to reclaim two historic abandoned mine sites in the northern Black Hills. Both mines had open adits and shafts, acid mine drainage, eroding streamside tailings, and small sulfide waste rock piles.

An engineering evaluation and cost analysis was completed by the USFS to evaluate and select remedial alternatives for the Minnesota Ridge Mine, about 6 kilometers (km) northeast of Rochford. The USFS, the EPA, and the DENR were reviewing various remedial alternatives and costs. It is uncertain at this time if EPA funding will be available for the private portions of the mine site. The USFS may begin reclamation of the public land portions as early as next summer.

BLM started reclamation of the Belle Eldridge Mine, about 2.4 km southeast of Deadwood. Last fall, the BLM contractor regraded the waste rock pile and removed about 8,000 cubic meters of tailings and placed them in a temporary storage area. During summer 2000, the tailings will be placed in a capped repository near the mine site. A wetland may be constructed to passively treat acid water discharging from the mine opening and acid seeping from the mine.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN SOUTH DAKOTA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998 r/		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clay: Common	182	W	188	W	190	W
Gemstones	NA	98	NA	W	NA	W
Gold 3/ kilograms	W	W	12,100	115,000	9,840	88,500
Gypsum, crude	51	469	W	W	W	W
Sand and gravel: Construction	10,200	34,100	10,100	35,600	9,510	34,100
Silver 3/ metric tons	4	693	2	321	2	261
Stone: Crushed	5,900	30,200	5,720	24,600	54,000	23,900
Combined values of cement, feldspar, iron ore (usable), lime, mica (crude), stone (dimension granite), and values indicated by symbol W	XX	263,000	XX	83,100	XX	79,000
Total	XX	328,000	XX	258,000	XX	226,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined
XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	4	3,110	$11,900	$3.82	4	2,920	$12,100	$4.15
Granite	1	1	13	13.00	2	W	W	W
Quartzite	9	2,790	18,300	6.55	9	W	W	W
Total or average	XX	5,900	30,200	5.11	XX	5,720	24,600	4.31

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	$7.09
Filter stone	W	W	6.14
Other coarse aggregate	51	$168	3.29
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	5.75
Bituminous aggregate, coarse	W	W	4.02
Bituminous surface-treatment aggregate	W	W	5.89
Railroad ballast	W	W	6.27
Other graded coarse aggregate	678	2,990	4.41
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	4.20
Screening, undesignated	W	W	4.24
Other fine aggregate	37	162	4.38
Coarse and fine aggregates:			
Graded road base or subbase	262	1,110	4.25
Crusher run or fill or waste	W	W	4.62
Other coarse and fine aggregates	256	1,130	4.41
Chemical and metallurgical:			
Cement manufacture	1,200	3,950	3.31
Lime manufacture	W	W	4.51
Unspecified: 3/			
Actual	W	W	4.41
Estimated	91	402	4.42
Total or average	5,720	24,600	4.31

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes granite, limestone, and quartzite.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
SOUTH DAKOTA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	--	--	W	W
Coarse aggregate, graded 4/	W	W	--	--	W	W
Fine aggregate (-3/8 inch) 5/	W	W	--	--	W	W
Coarse and fine aggregate 6/	W	W	--	--	W	W
Other construction materials	845	4,270	--	--	1,340	6,080
Chemical and metallurgical 7/	(8/)	(8/)	--	--	--	--
Unspecified: 9/						
Actual	(8/)	(8/)	(10/)	(10/)	(10/)	(10/)
Estimated	490	3	--	--	90,700	400
Total	2,920	12,100	(10/)	(10/)	(10/)	(10/)

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported in District 2.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (bituminous mix or seal), and screening (undesignated), and other fine aggregates.

6/ Includes crusher run (select material or fill), graded road base or subbase, and other coarse and fine aggregates.

7/ Includes cement manufacture, and lime manufacture.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Reported and estimated production without a breakdown by end use.

10/ Withheld to avoid disclosing company proprietary data.

TABLE 5
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	1,290	$6,730	$5.20
Plaster and gunite sands	74	389	5.26
Asphaltic concrete aggregates and other bituminous mixtures	735	2,610	3.55
Road base and coverings	3,660	8,940	2.44
Fill 2/	492	1,320	2.69
Snow and ice control	15	54	3.60
Unspecified: 3/			
Actual	626	2,510	4.00
Estimated	3,240	13,000	4.02
Total or average	10,100	35,600	3.51

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes roofing granules.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
SOUTH DAKOTA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	117	689	W	W	876	4,160
Asphaltic concrete aggregates and other bituminous mixtures	--	--	W	W	W	W	295	1,130
Road base and coverings	620	1,310	837	1,710	707	1,420	1,490	4,490
Fill 3/	6	7	13	28	94	266	394	1,080
Unspecified: 4/								
Actual	W	W	W	W	W	W	443	1,970
Estimated	543	1,810	757	2,490	1,140	4,820	801	3,920
Total	1,580	5,540	2,170	6,400	2,090	6,900	4,300	16,800

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

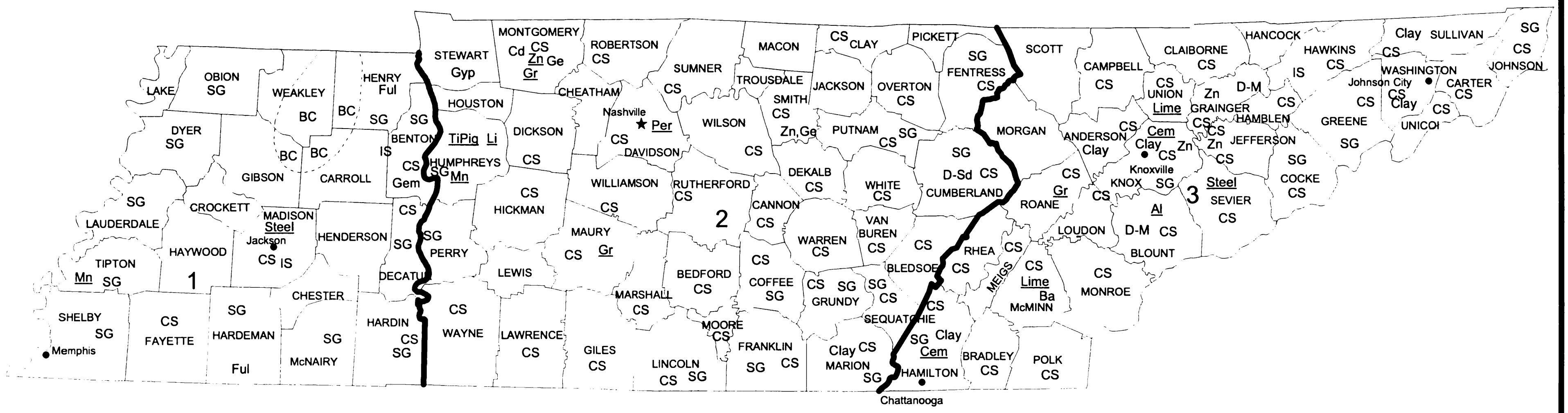
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes snow and ice control and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TENNESSEE



LEGEND

—	County boundary
★	Capital
●	City
1 ━	Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Al	Aluminum plant	CS	Crushed stone	Gyp	Gypsum	SG	Construction sand and gravel
Ba	Barite	D-M	Dimension marble	IS	Industrial sand	Steel	Steel plant
BC	Ball clay	D-Sd	Dimension sandstone	Li	Lithium plant	TiPig	Titanium dioxide pigment plant
Cd	Cadmium (See Zn)	Ful	Fuller's earth	Lime	Lime plant	Zn	Zinc
Cem	Cement plant	Ge	Germanium	Mn	Manganese dioxide plant	Zn	Zinc refinery (Cd byproduct cadmium) (Ge byproduct germanium)
Clay	Common clay	Gem	Gemstones	Per	Perlite plant		
		Gr	Graphite plant				

◌ Concentration of mineral operations

0 50 Kilometers

Source: Tennessee Division of Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF TENNESSEE

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Tennessee Department of Environment and Conservation, Division of Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Tennessee was $710 million, according to the U.S. Geological Survey (USGS). This was about a 1% increase from that of 1998,[2] following a marginal decrease from 1997 to 1998. Tennessee remained 20th in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for about 2% of the U.S. total.

Crushed stone has been Tennessee's leading mineral commodity, by value, for more than 25 years, except for 1981 when zinc was first. In 1999 crushed stone accounted for about 54% of the State's total nonfuel mineral production value. Tennessee's increase in value in 1999 resulted mostly from a $13 million rise in crushed stone, plus smaller yet significant increases in the values of construction and industrial sand and gravel and portland cement. (All listings are in descending order of relative change.) Increases also occurred in ball clay, gemstones, and masonry cement, but these were inconsequential to the net result. The only substantial decrease was a more than $12 million drop in the value of zinc. Most other nonfuel minerals showed relatively small decreases or remained the same. In 1998, crushed stone, up $21 million, construction sand and gravel, up $10.3 million, portland cement, and salt led the State's increase in nonfuel mineral value. A substantial drop in the value of zinc plus significant decreases in gemstones, lime, and fuller's earth resulted in a small net decrease for the year (table 1).

Compared with USGS estimates of the quantities produced in the 50 States in 1999, Tennessee remained the leading gemstone- and ball clay-producing State, second in zinc, and third in barite. The State continued to be 10th in the production of crushed stone and industrial sand and gravel, and was a significant producer of common clays. Primary aluminum and raw steel were produced in Tennessee, but were processed from materials obtained from other domestic and foreign sources. The State ranked 10th in the production of primary aluminum.

The Tennessee Division of Geology provided the following narrative information.[3] In 1999, a total of 303 nonfuel mineral operations were registered in 80 counties throughout the State.

Ball clay was mined by the Gleason Brick Co, H.C. Spinks Co., Kentucky-Tennessee Clay Co., Old Hickory Clay Co., and Unimin Corp. in west Tennessee. Also, General Shale Products Corp. operated nine ball clay mines in four counties in east Tennessee to supply its brick production plants. General Shale Products Corp. joined the Wienerberger Group headquartered in Vienna, Austria, in July 1999. Fullers earth was mined in west Tennessee in Hardeman County by Moltan Co.

Yates Construction Co. owns barite mines in McMinn and Monroe Counties. The open pit mines produced pharmaceutical grade barite, but only the McMinn Mine was in production.

Construction sand and gravel was produced at 92 sites in 31 counties and operated by 57 different companies. Companies operating five or more sites included: Ford Construction Co., Memphis Stone and Gravel Co., and Standard Construction Co. in District 1 (west Tennessee), and Bradley Stone and Gravel Inc. in the eastern part of District 2 (middle Tennessee).

Tennessee's crushed stone industry had the widest production distribution and produced limestone and dolomite, except the Maymead Lime Co. which produced crushed granite in Johnson County. Crushed stone was produced in 64 counties by 63 different companies, 18 of which were operated by county governments. The top three producers were (1) Vulcan Materials Co., which operated 33 quarries in 24 counties; (2) Rogers Group, Inc., which operated 25 quarries in 22 counties; and (3) American Limestone Co., which operated 8 quarries in 5 counties.

The Tennessee Marble Co. quarried Holston Marble for dimension stone from Blount County, and the Imperial Black Marble Co. produced dimension stone from the Maryville Limestone quarry in Grainger County. Quartzitic sandstone was quarried on the Cumberland Plateau for dimension stone, flagstone, and ashlar. Although there were a number of individuals who independently quarried the sandstone, no quarries were registered with the State in 1999.

The American Shell Co. and the Tennessee Shell Co. harvested mollusk shells from the Tennessee River and sold crushed shells for seeds in the cultured-pearl industry. The American Pearl Co. farmed pearls in the Tennessee River in Benton County.

The Coker Creek gold district in Monroe County suffered a loss when the main structure at Coker Creek Village was destroyed by fire in the fall of 1999. Coker Creek Village supported the local economy by attracting tourists to pan for natural gold in Coker Creek. Plans are to rebuild and continue the gold panning for a fee operation.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Peter Lemizki, Chief Geologist with the Tennessee Division of Geology in Knoxville, authored the text of mineral industry information submitted by that agency.

Lime plants operated by Bowater Southern Paper Corp. in McMinn County and Global Stone Tenn-Luttrell, Inc. in Union County produced high-calcium quicklime and high-calcium hydrated lime. Global Stone Tenn-Luttrell was owned by Global Stone Corp., which was acquired by Oglebay Norton Co., in a stock purchase in the spring of 1998.

Three active operations mining high-silica sand were in Carol, Hawkins, and Madison Counties. Short Mountain Silica Co. operated the only mine in east Tennessee, and Unimin Corp. and U.S. Silica Co. operated mines in west Tennessee.

Grupo Mexico S.A. de C.V., purchased from ASARCO Incorporated four zinc mines in Knox and Jefferson Counties: the New Market, Young, Immel, and Coy Mines. The New Market Mine continued on standby status. The Young, Immel, and Coy Mines operated at 4,200 metric tons per day (t/d), 1,900 t/d, and 1,130 t/d, respectively.

In February 1999, Pasminco Ltd. completed the takeover of Savage Resources Ltd., and acquired the electrolytic zinc plant in Clarksville and underground mines at Gordonsville and Clinch Valley. Prior to the takeover, in the spring of 1998, Savage Zinc Inc., announced plans for a $400 million expansion of the Clarksville Zinc Plant (The Oak Ridger, 1998). The Clarksville Zinc Plant was commissioned in 1979 and operated at approximately 95,000 metric tons per year, which accounted for 28% of U.S. zinc production. The plant was one of two companies in the United States that produced primary cadmium as a byproduct during roasting and leaching of the zinc concentrate. The mines at Gordonsville (including the Elmwood and Cumberland Mines) in Smith County produced the highest grade zinc concentrate in the world at 64.5% and were also one of the largest sources of germanium in the world. The Clinch Valley Mine in Grainger County was reopening after being on standby for care and maintenance.

Reference Cited

The Oak Ridger, 1998, Savage Zinc plans $400M expansion, The Oak Ridger, p. 5.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TENNESSEE 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 r/ Quantity	1998 r/ Value	1999 p/ Quantity	1999 p/ Value
Clays: Ball	689	29,200	712	30,100	719	30,800
Gemstones	NA	9,740	NA	W	NA	W
Sand and gravel:						
Construction	8,650	39,500	9,410	49,800	9,740	52,500
Industrial	898	16,500	999	17,100	1,050	18,900
Stone: Crushed	60,400	349,000	63,600	370,000	64,000	383,000
Combined values of barite, cement, clays [common, fuller's earth, kaolin (1997-98)], copper (1997-98), lead, lime, salt (1998-99), silver (1998-99), stone (dimension marble), zinc, and values indicated by symbol W	XX	263,000	XX	237,000	XX	225,000
Total	XX	707,000	XX	705,000	XX	710,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
TENNESSEE: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	108	54,300	$316,000	$5.82	111	56,800	$329,000	$5.80
Dolomite	10	W	W	5.49	10	6,200	37,600	6.05
Granite	1	W	W	4.65	1	W	W	4.97
Sandstone	2	W	W	7.01	2	W	W	8.91
Total or average	XX	60,400	349,000	5.79	XX	63,600	370,000	5.83

W Withheld to avoid disclosing proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$5.34
Riprap and jetty stone	1,350	$7,920	5.87
Filter stone	999	5,270	5.27
Other coarse aggregate	699	3,710	5.30
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,590	20,900	5.83
Bituminous aggregate, coarse	11,200	69,600	6.20
Bituminous surface-treatment aggregate	1,270	8,280	6.52
Railroad ballast	89	539	6.06
Other graded coarse aggregate	3,620	23,500	6.48
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1,150	9,140	7.92
Stone sand, bituminous mix or seal	118	779	6.60
Screening, undesignated	3,210	19,800	6.17
Other fine aggregate	437	2,850	6.51
Coarse and fine aggregates:			
Graded road base or subbase	15,200	81,600	5.35
Unpaved road surfacing	77	369	4.79
Terrazzo and exposed aggregate	W	W	5.51
Crusher run or fill or waste	1,700	8,160	4.80
Other coarse and fine aggregates	1,790	10,800	6.04
Other construction materials	W	W	6.52
Agricultural limestone	432	3,150	7.29
Chemical and metallurgical:			
Cement manufacture	W	W	4.41
Lime manufacture	W	W	15.45
Sulfur oxide removal	W	W	5.27
Special:			
Mine dusting or acid water treatment	9	197	21.89
Other fillers or extenders	178	2,780	15.63
Roofing granules	W	W	7.15
Unspecified: 3/			
Actual	5,900	32,900	5.58
Estimated	7,900	38,900	4.92
Total or average	63,600	370,000	5.83

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, and sandstone.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
TENNESSEE: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	W	W	1,860	9,310	W	W
Coarse aggregate, graded 3/	W	W	8,080	48,700	W	W
Fine aggregate (-3/8 inch) 4/	W	W	1,620	9,970	W	W
Coarse and fine aggregate 5/	W	W	7,760	38,400	W	W
Other construction materials	--	--	W	W	W	W
Agricultural 6/	W	W	W	W	W	W
Chemical and metallurgical 7/	--	--	W	W	W	W
Special 8/	--	--	--	--	W	W
Unspecified: 9/						
Actual	--	--	5,120	28,200	776	4,670
Estimated	850	3,680	5,700	28,500	1,350	6,670
Total	7,140	45,500	30,900	168,000	25,500	157,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregates.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone.

7/ Includes cement manufacture, lime manufacture, and sulfur oxide removal.

8/ Includes mine dusting or acid water treatment, other fillers or extenders, and roofing granules.

9/ Reported and estimated production without a breakdown by end use.

TABLE 5
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	2,960	$19,700	$6.67
Concrete products (blocks, bricks, pipe, decorative, etc.)	200	981	4.91
Asphaltic concrete aggregates and other bituminous mixtures	641	3,230	5.04
Road base and coverings	1,200	4,590	3.83
Road stabilization (cement)	104	427	4.11
Fill	180	794	4.41
Other miscellaneous uses 3/	30	264	8.80
Unspecified: 4/			
Actual	1,030	6,030	5.86
Estimated	3,070	13,700	4.48
Total or average	9,410	49,800	5.29

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes filtration.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
TENNESSEE: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,990	14,000	W	W	W	W
Asphaltic concrete aggregates and other road base materials 3/	1,380	4,290	W	W	W	W
Other miscellaneous uses 4/	W	W	W	W	W	W
Unspecified: 5/						
Actual	W	W	W	W	W	W
Estimated	2,390	9,910	206	808	470	3,020
Total	6,580	32,700	1,920	9,900	910	3,020

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

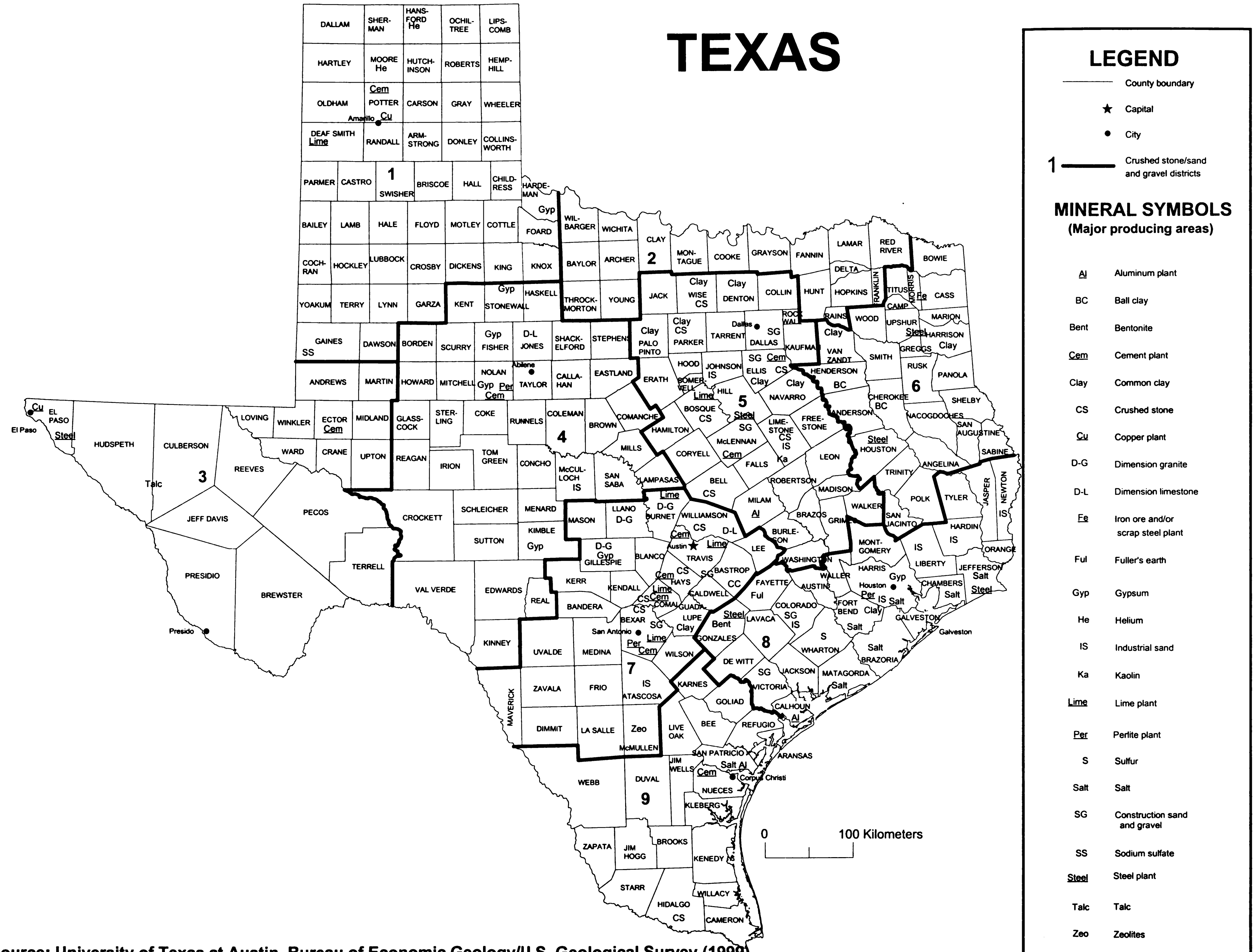
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes fill and filtration.

5/ Reported and estimated production without a breakdown by end use.

TEXAS



Source: University of Texas at Austin, Bureau of Economic Geology/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF TEXAS

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the University of Texas at Austin, Bureau of Economic Geology, for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Texas was $1.78 billion, according to the U.S. Geological Survey (USGS). This was about a 2% decrease from that of 1998,[2] and followed a 2.2% increase from 1997 to 1998. Texas ranked sixth in the Nation (it was fifth in 1998) in total nonfuel mineral production value, of which the State accounted for almost 5% of the U.S. total.

In 1999, 91% of Texas' nonfuel mineral value came from the production of the State's top five industrial minerals, in descending order of value: portland cement, crushed stone, construction sand and gravel, lime, and salt. (The following mineral listings are in descending order of relative change in value.) Although crushed stone, portland cement, and lime values showed a total increase of $77 million, the State's nonfuel mineral value dropped, mostly owing to a cessation of production of magnesium metal and crude and Grade-A helium, as well as decreased values in construction sand and gravel (table 1). In 1998, increases of $70 million in the value of construction sand and gravel, $59 million in crushed stone, and $45 million in portland cement provided most of the State's overall rise in value. Dimension stone, lime, and masonry cement had smaller yet significant increases in value (table 1). Decreases in the values of magnesium metal, Frasch sulfur, and Grade-A helium, as well as smaller yet significant drops in those of industrial sand and gravel, salt, and common clays, offset a large portion of the overall increase in nonfuel mineral values for the year (table 1). All other value changes for 1998 and 1999 were relatively small and inconsequential to the State's net changes in value.

Based upon USGS estimates of the quantities of minerals produced in the 50 States in 1999, Texas remained first in crushed stone; second in portland cement, construction sand and gravel, salt, talc, ball clay, and zeolites; second of two Frasch sulfur- and two greensand marl-producing States; third in gypsum and common clay; fifth in lime; and eighth in masonry cement. Whereas the State increased to 2d from 3d of three crude helium-producing States, it dropped to 6th from 4th in industrial sand and gravel and to 11th from 10th in the production of dimension stone.

The Texas metal industry produced raw steel, primary aluminum, copper, and smaller amounts of other metals. Sources of plant feed included scrap metal and ores acquired from other domestic or foreign sources. Texas produced an estimated 3.75 million metric tons of raw steel, as reported by the American Iron and Steel Institute. Based upon USGS data, the State ranked eighth in primary aluminum production.

The following narrative information was provided by the Texas Bureau of Economic Geology[3] (BEG). The nonfuel mineral industry of Texas continued to grow during 1999. The only significant decrease in nonfuel mineral value resulted from the November 1998 shut down of Dow Chemical Co.'s magnesium metal plant in Freeport (Olafson, 1998). Dow concluded that damage from recent tropical storms and hurricanes had resulted in continued production problems and that costs had become too high to keep the operation going. In much of the rest of the minerals industry, the increase in population and growth in industry spurred activity in mineral production by creating a demand for materials used in developing infrastructure. Production of aggregate and most other industrial minerals needed for manufacturing building products responded to increased construction activity.

Overall, annual job growth in mining, reported by the Texas Labor Market Review, decreased 10.3% between December 1998 and December 1999 (Griffis, 1998; 1999). However, records of the Texas Workforce Commission show increases in employment in construction and manufacturing related to mineral products during 1999. The construction job annual growth rate was 4.9%. Between December 1998 and December 1999, jobs related to stone, clay, and glass products increased by 2%, and those related to concrete, gypsum, and plaster products increased by about 6.5%. The overall decrease was mostly the result of extensive layoffs in the oil and gas industry. Persistently low crude oil prices affected sectors of the mining, construction, and manufacturing industries that supported drilling activities in Texas.

According to the BEG, overall activity in the State's nonfuel mineral industry was above average during 1999. Based upon recent trends in population growth and commercial development, production of the State's mineral resources used in construction and basic infrastructure was expected to continue to grow.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Sigrid Clift, Public Information Geologist, authored the text of mineral industry information submitted by the Texas Bureau of Economic Geology.

References Cited

Griffis, Clayton, ed., 1998, Texas labor market review: Austin, Texas Workforce Commission, December, 8 p.

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Olafson, Steve, 1998, Dow magnesium plant to shut down in Freeport: Houston Chronicle, November 20, p. 2c.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN TEXAS 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	203	18,900 e/	216	20,500 e/	222	21,000 e/
Portland	8,280	576,000 e/	8,430	621,000 e/	8,640	636,000 e/
Clays:						
Common	2,150	13,600	2,120	10,100	2,130	9,820
Kaolin	35	7,600	W	W	W	W
Gemstones	NA	11	NA	11	NA	11
Gypsum, crude	2,260	15,700	2,260	15,500	2,310	15,800
Lime	1,470	91,500	1,620	101,000	1,750	109,000
Salt	9,780	91,000	9,420	83,900	9,400	83,800
Sand and gravel:						
Construction	60,100	284,000	74,600	354,000	71,600	347,000
Industrial	1,830	48,800	1,760	38,500	1,750	38,800
Stone:						
Crushed	81,000	338,000	99,300	397,000	110,000	451,000
Dimension metric tons	35,300	11,300	40,900	16,700	37,100	16,700
Talc and pyrophyllite do.	274,000	6,760	274,000	6,770	W	W
Zeolites do.	(3/)	NA	(3/)	NA	NA	NA
Combined values of clays (ball, bentonite, fuller's earth), greensand marl (1998-99), helium [crude, Grade-A (1997-98)], magnesium compounds (1997-98), magnesium metal (1997-98), sodium sulfate [natural (1997)], sulfur (Frasch), and values indicated by symbol W	XX	281,000	XX	158,000	XX	46,700
Total	XX	1,780,000	XX	1,820,000	XX	1,780,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data.

TABLE 2
TEXAS: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	109	77,400	$322,000	$4.16	120	92,500	$370,000	$4.00
Dolomite	1	W	W	3.06	1	W	W	3.77
Granite	2	W	W	6.02	10	489	2,090	4.27
Marble	11	W	W	20.33	34	W	W	29.24
Calcareous marl	2	W	W	2.24	2	W	W	3.86
Sandstone and quartzite	5	709	4,910	6.92	5	938	4,070	4.34
Traprock	1	W	W	7.44	1	W	W	7.19
Volcanic cinder and scoria	1	156	809	5.19	2	W	W	5.04
Miscellaneous stone	3	W	W	2.46	16	3,260	10,800	3.31
Total or average	XX	81,000	338,000	4.17	XX	99,300	397,000	4.00

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$12.40
Riprap and jetty stone	171	$1,450	8.50
Filter stone	76	363	4.78
Other coarse aggregate	1,790	5,250	2.94
Coarse aggregate, graded:			
Concrete aggregate, coarse	15,500	74,600	4.80
Bituminous aggregate, coarse	5,050	29,100	5.77
Bituminous surface-treatment aggregate	714	3,340	4.67
Railroad ballast	W	W	4.95
Other graded coarse aggregate	6,110	23,700	3.88
Fine aggregate (-3/8 inch):			
Stone sand, concrete	3,200	15,100	4.72
Stone sand, bituminous mix or seal	1,250	4,710	3.76
Screening, undesignated	1,230	4,010	3.25
Other fine aggregate	2,900	9,060	3.13
Coarse and fine aggregates:			
Graded road base or subbase	19,900	68,800	3.46
Unpaved road surfacing	68	248	3.65
Terrazzo and exposed aggregate	75	986	13.15
Crusher run or fill or waste	3,590	10,400	2.89
Other coarse and fine aggregates	3,290	10,900	3.32
Other construction materials	441	1,920	4.36
Agricultural:			
Agricultural limestone	175	863	4.93
Poultry grit and mineral food	W	W	6.72
Other agricultural uses	245	2,070	8.44
Chemical and metallurgical:			
Cement manufacture	10,300	35,900	3.49
Lime manufacture	(3/)	(3/)	5.38
Flux stone	(3/)	(3/)	5.99
Chemical stone	(3/)	(3/)	4.14
Sulfur oxide removal	(3/)	(3/)	4.66
Special:			
Mine dusting or acid water treatment	(3/)	(3/)	4.36
Asphalt fillers or extenders	(3/)	(3/)	10.38
Other fillers or extenders	807	10,700	13.29
Other miscellaneous uses:			
Waste material	36	159	4.42
Other specified uses not listed	37	325	8.78
Unspecified: 4/			
Actual	5,240	21,000	4.00
Estimated	15,400	51,500	3.33
Total or average	99,300	397,000	4.00

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes calcareous marl, dolomite, granite, limestone, marble, miscellaneous stone, sandstone and quartzite, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
TEXAS: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W	370	1,450
Fine aggregate (-3/8 inch) 5/	W	W	W	W	W	W
Coarse and fine aggregate 6/	24	98	W	W	W	W
Other construction materials	147	1,240	559	2,380	89	393
Agricultural 7/	--	--	(8/)	(8/)	(8/)	(8/)
Chemical and metallurgical 9/	--	--	--	--	(8/)	(8/)
Special 10/	--	--	--	--	--	--
Other miscellaneous uses	--	--	--	--	--	--
Unspecified: 11/						
Actual	--	--	--	--	--	--
Estimated	330	1,090	(8/)	(8/)	(8/)	(8/)
Total	501	2,430	711	2,970	3,820	14,400

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	271	1,190	37	217
Coarse aggregate, graded 4/	W	W	8,710	44,200	--	--
Fine aggregate (-3/8 inch) 5/	W	W	3,120	11,200	--	--
Coarse and fine aggregate 6/	1,390	5,000	3,760	15,800	163	798
Other construction materials	5,960	28,300	(8/)	(8/)	--	--
Agricultural 7/	--	--	(8/)	(8/)	--	--
Chemical and metallurgical 9/	(8/)	(8/)	3,800	13,800	--	--
Special 10/	(8/)	(8/)	(8/)	(8/)	--	--
Other miscellaneous uses	--	--	(8/)	(8/)	--	--
Unspecified: 11/						
Actual	--	--	2,340	9,700	--	--
Estimated	1,650	5.170	8,460	27,300	394	1,290
Total	9,540	40,700	31,700	133,000	594	2,310

	District 7		District 9		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	1,670	5,210	--	--	--	--
Coarse aggregate, graded 4/	13,500	60,600	--	--	--	--
Fine aggregate (-3/8 inch) 5/	3,960	15,900	--	--	--	--
Coarse and fine aggregate 6/	17,700	55,200	3,540	13,100	--	--
Other construction materials	(8/)	(8/)	--	--	--	--
Agricultural 7/	(8/)	(8/)	--	--	--	--
Chemical and metallurgical 9/	6,400	23,100	--	--	--	--
Special 10/	(8/)	(8/)	--	--	--	--
Other miscellaneous uses	(8/)	(8/)	--	--	--	--
Unspecified: 11/						
Actual	2,900	11,300	--	--	--	--
Estimated	1,590	5,580	328	1,100	16	125
Total	48,600	187,000	3,870	14,200	16	125

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ District 8 included with District 9 to avoid disclosing company proprietary data.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture, chemical stone or alkali works, flux stone, lime manufacture, and sulfur oxide removal.

10/ Includes asphalt fillers or extenders, mine dusting or acidic water treatment, and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	19,200	$98,500	$5.13
Plaster and gunite sands	293	1,520	5.18
Concrete products (blocks, bricks, pipe, decorative, etc.)	205	704	3.43
Asphaltic concrete aggregates and other bituminous mixtures	1,310	9,140	6.96
Road base and coverings	2,930	9,770	3.34
Road stabilization (cement)	684	2,590	3.79
Road stabilization (lime)	13	69	5.31
Fill	7,680	13,500	1.76
Snow and ice control	4	34	8.50
Roofing granules	80	884	11.05
Other miscellaneous uses 2/	135	955	7.07
Unspecified: 3/			
Actual	13,300	77,300	5.83
Estimated	28,800	139,000	4.84
Total or average	74,600	354,000	4.75

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

2/ Includes filtration.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
TEXAS: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	484	4,040	W	W	251	1,200	189	1,600
Asphaltic concrete aggregates and other bituminous mixtures	702	6,120	--	--	--	--	W	W
Road base and coverings 3/	369	1,770	W	W	W	W	W	W
Other miscellaneous uses 4/	W	W	--	--	W	W	W	W
Unspecified: 5/								
Actual	W	W	W	W	--	--	W	W
Estimated	2,630	11,700	470	2,110	825	3,760	1,480	8,560
Total	4,350	24,400	1,450	9,000	1,090	5,060	1,780	11,000

	District 5		District 6		District 7		District 8	
	Quantity	Value		Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	3,200	17,800	W	W	1,860	7,330	10,200	46,800
Asphaltic concrete aggregates and other bituminous mixtures	--	--	--	--	W	W	W	W
Road base and coverings 3/	1,160	2,990	W	W	W	W	1,890	6,600
Other miscellaneous uses 4/	148	1,470	--	--	1,160	2,010	5,660	9,800
Unspecified: 5/								
Actual	9,640	56,700	W	W	W	W	W	W
Estimated	4,770	21,400	1,430	7,740	3,670	17,900	10,000	44,800
Total	19,700	102,000	1,720	9,060	9,320	43,200	28,100	109,000

	District 9		Unspecified	
	Quantity	Value		Value
Concrete aggregate and concrete products 2/	2,690	15,700	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	--	--
Road base and coverings 3/	W	W	--	--
Other miscellaneous uses 4/	W	W	--	--
Unspecified: 5/				
Actual	--	--	538	2,560
Estimated	3,480	21,300	--	--
Total	6,580	39,300	538	2,560

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

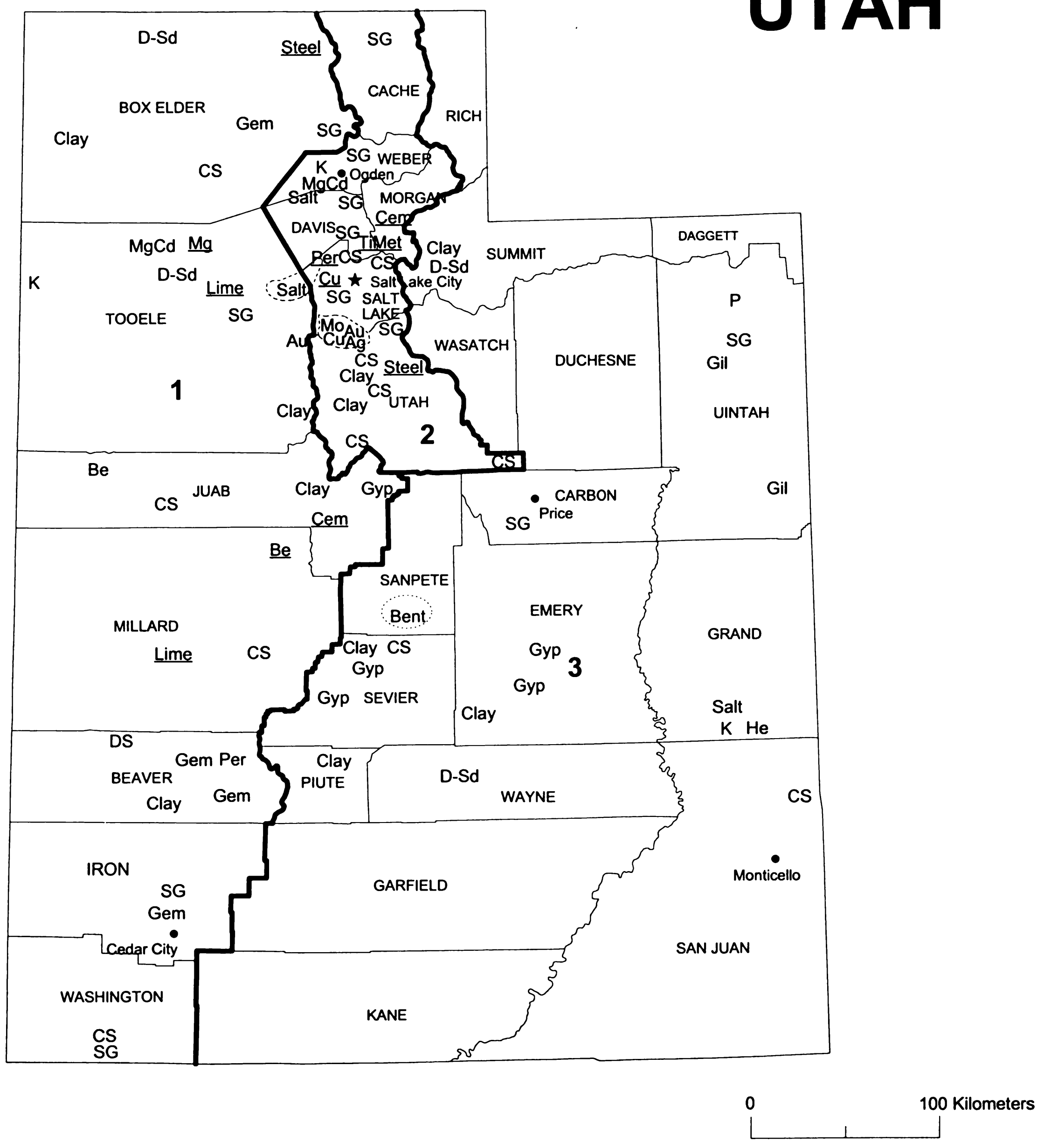
3/ Includes road and other stabilization (cement and lime).

4/ Includes fill, filtration, roofing granules, and snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

6/ Includes production within the State with no districts reported.

UTAH



Source: Utah Geological Survey/U.S. Geological Survey (1999)

LEGEND

—	County boundary
★	Capital
●	City
1 —	Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Ag	Silver
Au	Gold
Be	Beryllium
Be	Beryllium plant
Bent	Bentonite
Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
D-Sd	Dimension sandstone
Gem	Gemstones
Gil	Gilsonite
Gyp	Gypsum
He	Helium
K	Potash
Lime	Lime plant
Mg	Magnesium metal plant
MgCd	Magnesium compounds
Mo	Molybdenum
P	Phosphate rock
Per	Perlite
Per	Perlite plant
Salt	Salt
SG	Construction sand and gravel
Steel	Steel plant
TiMet	Titanium metal plant
◌	Concentration of mineral operations

THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Utah was $1.26 billion, according to the U.S. Geological Survey (USGS). This was about a 6% decrease from that of 1998,[2] and followed a 20.2% decrease from 1997 to 1998. The State ranked 11th (9th in 1998) among the 50 States in total nonfuel mineral production value, of which Utah accounted for more than 3% of the U.S. total.

Metals accounted for about 62% of Utah's nonfuel mineral production value, copper being a substantial majority of the State's entire metal value. In 1999, the largest increase in value was an approximate $22 million increase in the value of potash. Smaller yet significant increases of about $4 million occurred in magnesium metal, portland cement, crushed stone, and magnesium compounds (descending order of the magnitude of change). However, decreases were greater, resulting in a net drop in value: copper was down $42 million; construction sand and gravel, $20 million; and gold, $5 million. Lime and molybdenum also had small yet significant decreases in value (table 1).

In 1998, the drop in Utah's value from that of 1997 was mainly attributable to decreases of about $200 million in the value of copper, $121 million in gold, $75 million in molybdenum, $14 million in phosphate rock, and almost $11 million in that of crushed stone (table 1). Smaller yet significant decreases occurred in silver and gypsum. Somewhat offsetting these decreases were higher values for construction sand and gravel, up about $41 million; portland cement, up about $29 million; and potash, up almost $9 million. Although the amounts of increase were smaller, magnesium metal and Grade-A helium also had significant increases.

Based upon USGS estimates of quantities produced in the 50 States during 1999, Utah remained the only State to produce beryllium concentrates and was the first of 2 magnesium-metal-producing States. The State continued as second in copper and potash; fourth in gold, molybdenum, phosphate rock, and Grade-A helium; and fifth in silver, bentonite, and perlite. Utah rose to third from fourth in magnesium compounds, to fifth from sixth in salt, to sixth from seventh in gemstones, but dropped from sixth to ninth in construction sand and gravel. Additionally, the State was a significant producer of lime.

The Utah Geological Survey[3] (UGS) provided the narrative information that follows. Production data in the following text are those reported by the UGS, based upon its own surveys, estimates, and information gathered from company annual reports. The UGS data may differ from some USGS preliminary estimates and production figures as reported to and estimated by the USGS.

Utah has 79 active large mines (excluding sand and gravel) that are grouped by industry segment as follows: base metals, 4; precious metals, 1; coal, 14; and industrial minerals, 60. The State has more than 350 active and permitted small mines; 80 reported production in 1998, the same number as in 1997. Producing small mines are grouped as follows: industrial minerals, 62 (including building, decorative, and dimension stone); gemstones, 7; precious and base metals, 7, and fossils and geodes, 4.

In December 1999, the Utah Division of Oil, Gas and Mining (DOGM) sent 434 annual production questionnaires to all large mine (2 hectares (ha) and larger disturbance) and small mine (less than 2 ha disturbance) permit holders. By March 10, 2000, 289 questionnaires had been returned. Sixty-one large mines and 98 small mines reported production. Several reporting mines produced more than one commodity. In addition, 12 coal mines reported production in 1999.

Base-metal production, valued at $626 million, was the largest contributor to the value of minerals produced in 1999. In descending order of value, those metals were: copper, magnesium metal, molybdenum, and beryllium. Kennecott Utah Copper Corp.'s Bingham Canyon Mine, a few kilometers west of Salt Lake City in Salt Lake County, was the State's only significant producer of copper, molybdenum, and silver and was a major producer of gold. The combined value of minerals produced from the Bingham Canyon Mine was more than one-third of the total value of all minerals produced statewide.

Kennecott's Bingham Canyon Mine produced approximately 279,000 metric tons (t) of copper metal in 1999, a slight decrease from 1998 production of approximately 298,000 t. Refinery production rose from 239,000 t to 265,000 t in 1999.

Magnesium Corp. of America produced magnesium metal from Great Salt Lake brines at its electrolytic plant at Rowley in Tooele County. The plant had a capacity to produce 40,000 metric tons per year (t/yr) magnesium metal (99.9% purity), but production was less than capacity in 1999 due to decreased worldwide demand and low domestic producer prices.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Robert Gloyn, Senior Geologist, and Roger Bon, Industry Outreach Specialist, at the Utah Geological Survey authored the text of the State minerals information provided by that agency.

The sole molybdenum producer in Utah was Kennecott's Bingham Canyon Mine, which produced more than 10,000 t of molybdenum concentrate (MoS_2) in 1999, a slight increase from the amount produced in 1998 (R.L. Bon and R.W. Gloyn, Utah Geological Survey, 1999 summary of mineral activity in Utah, accessed November 15, 2000, via URL http://www.ugs.state.ut.us/economic.htm). Bingham Canyon was 1 of 8 (down from 11 in 1998) molybdenum-producing mines in the United States in 1999.

Utah led the Nation in production of beryllium. Brush Wellman Inc. mined beryllium ore (bertrandite) at its Topaz and Hogs Back Mines in Juab County and processed it with imported beryl at the company's plant a few kilometers north of Delta in Millard County. The product (beryllium hydroxide) was then sent to the company-owned refinery and finishing plant in Ohio where it was converted into beryllium metal, alloys, and oxide. In 1999, approximately 91,000 t of ore was mined and trucked to the company's Delta plant for processing, a slightly lower amount than in 1998. The demand for beryllium alloys and beryllium oxide has increased modestly over the past several years as alloys are increasingly being used in components for the automotive and electronics industries.

No vanadium or uranium ores were mined in Utah in 1999, although the White Mesa mill, near the town of Blanding in San Juan County, processed stockpiled vanadium and uranium ores mined in Colorado. Vanadium (V_2O_5) 907 t and uranium (U_3O_8) 221 t were recovered.

Precious-metal production, valued at $153 million, included gold (87% of total value) and silver (13% of total value). Gold production in 1999 was estimated to be more than 15 t, a slight increase from the nearly 14 t produced in 1998. Gold was produced from two surface mines owned by Kennecott Corp.: one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both in Salt Lake County. Several small mines in the State produced minor amounts of precious metals, but metal-specific production was not reported and was not included in the above totals. In 1999, silver production statewide was estimated to be approximately 115 t, nearly 9 t less than in 1998. The Bingham Canyon Mine produced nearly all of this silver as a byproduct metal of copper mining.

The industrial minerals segment, with 1999 production valued at $583 million, was the second-largest contributor to the value of minerals produced in Utah. Major commodities produced by group or individual commodity in descending order of value included: (1) sand and gravel and crushed stone; (2) portland cement, lime, limestone, and dolomite; (3) salines, including sulfate of potash, salt, potash (KCl), and magnesium chloride; (4) phosphate rock; (5) gilsonite; (6) common clay and bentonite; (7) expanded shale and perlite; and (8) gypsum.

Sand and gravel and crushed stone (including limestone and dolomite) were the largest contributors to the value of industrial minerals produced in 1999. These materials were produced in every county in Utah by commercial operators, and by State, Federal, and county agencies. Data compiled by the USGS show that in 1998, 40.7 million metric tons (Mt) of sand and gravel and 11.8 Mt of crushed stone were produced with a combined value of $179.3 million. UGS's estimate for the combined value of sand and gravel and crushed stone for 1999 (based upon the USGS 1999 midyear data) was $188.7 million. Several large crushed stone producers included: Valley Asphalt Co. from two quarries in Utah County, Staker Paving and Construction Co. from one quarry in Salt Lake County and one quarry in Utah County, IME Inc. from one quarry in Utah County, and Harper Construction Co. from one quarry in Salt Lake County. Due to increased highway construction, airport runway construction, rapid population growth, and railroad maintenance (ballast), usage should remain relatively high for the next several years.

Portland cement, lime, limestone, and dolomite were the second highest value industrial minerals produced in 1999 with a combined value of $156.4 million. Two operators produced portland cement in Utah: Holnam, Inc. and Ash Grove Cement Co. Holnam's Devil's Slide plant is east of Morgan in Morgan County, and Ash Grove's Leamington plant is east of Lynndyl in Juab County. The two plants have a combined capacity of more than 1.4 million metric tons per year of cement. Both plants operated at or near capacity in 1999.

Lime production was slightly higher in 1999 than in 1998. Continental Lime Co., which produced high-calcium and dolomitic quicklime, and Chemical Lime Co., which produced dolomitic quicklime and hydrate, had a combined capacity of more than 900,000 t/yr. Both operations served markets in Utah and surrounding States. Continental Lime's plant is approximately 56 kilometers (km) southwest of Delta in Millard County, and Chemical Lime of Arizona's plant is near Grantsville in Tooele County.

Nine large mine operators quarried 3.2 Mt of limestone and dolomite in 1999, of which 1.94 Mt was used in the construction industry. Approximately 272,000 t was used in steelmaking and for flue gas desulfurization in powerplants. A small amount of limestone and dolomite was also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Saline resources were the third largest contributor to the value of industrial mineral production in Utah. In addition to salt, saline products included magnesium chloride, potash (potassium chloride or KCl), and sulfate of potash (SOP). One company, North Shore Limited Partnership, produced a small amount of concentrated brine, which was used as an ingredient in health food mineral supplements. The statewide production of salt and other saline products, excluding magnesium metal, was estimated to be 2.9 Mt in 1999, 420,000 t more than in 1998.

Salt production alone was estimated to be 2.12 Mt in 1999, with most of the production coming from three operators using brine from Great Salt Lake. These operators were, in descending order of production: IMC Kalium Ogden, Inc. (formerly GSL Minerals, Inc.), Cargill Salt Co., and Morton International, Inc. In addition, three other companies produced salt from operations not related to Great Salt Lake: Reilly Chemical Co. at Wendover in Tooele County, Moab Salt Co. (a subsidiary of Potash Corp. of Saskatchewan) near Moab in Grand County, and Redmond Minerals Inc. near Redmond in Sanpete County.

KCl and SOP were produced by three companies: IMC Kalium Ogden Inc. (SOP), Reilly Chemical Co. (KCl), and Moab Salt Co. (KCl). Potash production was estimated to be more than 426,000 t in 1999, approximately 36,000 t less than in 1998.

Utah's only active phosphate mine, SF Phosphate Ltd.'s Vernal Phosphate Operation, is 18 km north of Vernal in Uintah County. SF Phosphate is a partnership of Farmland Industries, Inc. (Missouri) and J.R. Simplot Co. (Idaho). During 1999 the mine produced substantially more than 2.3 Mt of ore, the highest production level in the past 8 years.

Gilsonite production for 1999 was estimated to be more than 45,000 t, approximately 9,000 t less than in 1998. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. The three operations that produced gilsonite are all near the town of Bonanza in eastern Uintah County. In descending order of production they were: American Gilsonite Co.'s Bonanza Mine, Zeigler Chemical and Minerals Co.'s Zeigler and Tom Taylor Mines, and Lexco, Inc.'s Cottonwood Mine.

More than 263,000 t of both common and high-alumina clay and approximately 91,000 t of bentonite were produced by five companies in 1999, a 23% increase in common and high-alumina clay and a 19% increase in bentonite compared with 1998. In descending order of production the companies were: Interstate Brick Co. (common clay), Interpace Industries Inc. (common clay), Redmond Minerals, Inc. (bentonite), Paradise Management Co. (high-alumina clay), and Western Clay Co. (bentonite). More than 75% of all clay was used in the manufacture of brick. Two other companies (Holnam Inc. and Ash Grove Cement Co.) mined modest amounts of shale for use in the manufacture of cement.

Two companies produced lightweight aggregate. Utelite Inc. mined more than 181,000 t of shale in 1999 to manufacture "expanded shale" for use in the construction industry. The mine is near the town of Wanship in Summit County. Production of "expanded shale" products has increased moderately over the past several years. Pearl Queen Perlite Corp. produced approximately 18,000 t of perlite in 1999 from its recently opened perlite mine northeast of Milford in Beaver County. The ore was trucked to the company's mill in Milford for processing and distribution.

Five large mine operators produced more than 435,000 t of gypsum in 1999, 73,000 t more than in 1998. The companies were, in descending order of production, Georgia Pacific Corp., U.S. Gypsum Co., Nephi Gypsum, H.E. Davis and Sons, and D.K. Gypsum Industries. Both U.S. Gypsum and Georgia Pacific operated wallboard plants near Sigurd in Sevier County. The majority of gypsum produced in Utah was used for making wallboard, but several operators supplied raw gypsum to regional cement companies for use as an additive to retard the setting time of cement and to the agriculture industry for use as a soil conditioner.

During 1999, DOGM received 8 large mine permit applications and 51 new small mine permit applications. Seven of the large mine applications were made to change from small to large mine status. These numbers represent no increase in large mine permit applications but an increase of nine small mine permit applications compared with 1998. New large mine permits included two dimension stone quarries, two precious metal mines, one limestone quarry (aggregate), one gypsum quarry, one gemstone mine, and one road construction permit for a potential phosphate mine. New small mine permits were grouped by commodity as follows: industrial minerals, 32; base and precious metals, 8; gems and fossils, 7; uranium/vanadium, 2; and other, 2.

Several mines and quarries, mostly for industrial rocks and minerals, began or substantially increased production in 1998 and 1999. Red Emerald Resource Corp. began production of red beryl from its Ruby Violet Mine southwest of Milford in Beaver County. Between January and September 1999, the company mined more than 43,000 t of material, including 8,240 t of ore, and recovered nearly 52,000 grams of run-of-mine beryl crystals. Valley Asphalt Co. opened two quarries in Utah County and produced more than 1.09 Mt of crushed stone in its first year of production in 1999. Twin Mountain began production from its railroad ballast quarry north of Milford in late 1997, produced more than 2,000 t in 1998, and continued to increase production in 1999. Pearl Queen Perlite Corp. substantially increased production in 1999, producing nearly 18,000 t of perlite from its deposit northeast of Milford. Substantial premining stripping was done at U.S. Gypsum's Kimbal Draw Mine in Emery County, with gypsum mining beginning in late 1999.

Exploration for base and precious metals in 1999 remained at a relatively low level. DOGM received 26 Notices of Intent (NOI) to explore, which was several more than in 1998, but significantly less than the 50 to 60 NOI's received per year during the early 1990's. Nine NOI's were for precious metals, 6 for base and precious metals, and 11 for industrial minerals. Most exploration for metals was concentrated in and around old mining districts, particularly in the Milford and Marysvale areas. Most exploration was done by small- to medium- sized companies; Breccia Development Co. (Milford, UT) was one of the most active metal explorers in the State, drilling more than 60 holes on several prospects in the Milford area. The few drilling programs by large companies were relatively small and limited in scope. No discoveries were announced.

Uncertainty about land status and availability continues to affect mineral exploration and development, particularly concerning the various wilderness proposals. There were two new wilderness developments in 1999. First, the U.S. Bureau of Land Management (BLM) released results of its reinventory of lands having wilderness characteristics in Utah. The BLM inventoried 7,674,463 ha of Federal land outside of existing wilderness study areas (WSA's) and concluded that 6,439,265 ha had wilderness characteristics. An additional 7,992,920 ha were contained in existing WSA's. The WSA's are now managed under Interim Management Policy and Guidelines for Lands Under Wilderness Review (IMP) and the "reinventory wilderness" areas are managed under current management plans. (URL accessed February 27, 2001 at http://www.ut.blm.gov/wilderness/faq-plan.htm).

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN UTAH 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997		1998 r/		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Beryllium concentrates metric tons	5,760	6	6,080	7	5,900	7
Clays: Common	299	4,510	298	4,760	300	4,650
Gemstones	NA	974	NA	W	NA	735
Salt	1,670	69,000	1,770	68,100	1,760	67,300
Sand and gravel: Construction	33,200	99,400	46,300	140,000	39,000	120,000
Stone: Crushed	11,100	50,200	7,820	39,500	8,100	42,000
Combined values of cement (portland), clays [bentonite, fuller's earth (1997)], copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, mercury (1997-98), molybdenum, perlite (crude), phosphate rock, potash, silver, and value indicated by symbol W	XX	1,450,000	XX	1,090,000 r/	XX	1,020,000
Total	XX	1,680,000	XX	1,340,000 r/	XX	1,260,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
UTAH: CRUSHED STONE SOLD OR USED, BY KIND 1/

	1997				1998			
Kind	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	15 r/	2,700 r/	$15,300 r/	$5.69 r/	16	3,100	$18,200	$5.88
Dolomite	3 r/	3,590 r/	13,000 r/	3.62 r/	3	3,250	14,400	4.44
Granite	1	W	W	3.76	1	W	W	3.86
Sandstone and quartzite	2	W	W	7.95 r/	4	W	W	5.19
Volcanic cinder and scoria	2 r/	54 r/	276 r/	5.11 r/	3	82	728	8.88
Miscellaneous stone	2 r/	W	W	4.52 r/	7	W	W	5.30
Total or average	XX	11,100	50,200	4.51	XX	7,820	39,500	5.06

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+ 1 1/2 inch):			
Riprap and jetty stone	27	$299	$11.07
Filter stone	W	W	3.39
Coarse aggregate, graded:			
Concrete aggregate, coarse	(3/)	(3/)	7.52
Railroad ballast	(3/)	(3/)	5.32
Other graded coarse aggregate	198	1,170	5.90
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	10.20
Screening, undesignated	17	85	5.01
Coarse and fine aggregates:			
Graded road base or subbase	(3/)	(3/)	3.32
Unpaved road surfacing	(3/)	(3/)	4.24
Terrazzo and exposed aggregate	(3/)	(3/)	18.79
Crusher run or fill or waste	(3/)	(3/)	3.30
Other coarse and fine aggregate	187	677	3.62
Drain fields	W	W	9.64
Other construction materials	5	17	3.40
Agricultural:			
Agricultural limestone	W	W	W
Poultry grit and mineral food	9	194	21.56
Chemical and metallurgical:			
Cement manufacture	W	W	7.50
Lime manufacture	W	W	3.85
Dead-burned dolomite manufacture	W	W	3.94
Chemical stone	W	W	3.80
Sulfur oxide removal	W	W	5.85
Special:			
Mine dusting or acid water treatment	W	W	W
Asphalt fillers or extenders	W	W	W
Other fillers or extenders	W	W	W
Unspecified: 4/			
Actual	3,050	13,500	4.41
Estimated	1,140	4,590	4.02
Total or average	7,820	39,500	5.06

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals.

2/ Includes dolomite, granite, limestone, limestone-dolomite, miscellaneous stone, sandstone and quartzite, volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data; included with "Other."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	W	W	W	W	8	35	--	--
Coarse aggregate, graded 3/	W	W	W	W	--	--	--	--
Fine aggregate (-3/8 inch) 4/	W	W	W	W	--	--	--	--
Coarse and fine aggregate 5/	W	W	W	W	(6/)	(6/)	--	--
Other construction materials	185	1,480	307	1,250	--	--	--	--
Agricultural 7/	(6/)	(6/)	(6/)	(6/)	--	--	--	--
Chemical and metallurgical 8/	2,420	12,100	(6/)	(6/)	(6/)	(6/)	--	--
Special 9/	(6/)	(6/)	--	--	(6/)	(6/)	--	--
Unspecified: 10/								
Actual	--	--	(6/)	(6/)	(6/)	(6/)	124	548
Estimated	161	708	979	3,880	--	--	--	--
Total	2,780	14,400	4,820	24,000	97	590	124	548

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, and riprap and jetty stone.

3/ Includes concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), and screening (undesignated).

5/ Includes crusher run (select material or fill), drain fields, graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregate.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Includes cement manufacture, chemical stone or alkali works, dead-burned dolomite manufacture, lime manufacture, and sulfur oxide removal.

9/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

10/ Reported and estimated production without a breakdown by end use.

TABLE 5
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	3,320	$15,000	$4.50
Plaster and gunite sands	92	627	6.82
Asphaltic concrete aggregates and other bituminous mixtures	1,040	5,740	5.54
Road base and coverings 2/	3,970	13,400	3.37
Road stabilization (cement)	665	1,580	2.38
Fill	2,580	5,010	1.95
Other miscellaneous uses 3/	91	276	3.03
Unspecified: 4/			
Actual	9,750	32,800	3.36
Estimated	24,800	65,900	2.65
Total or average	46,300	140,000	3.03

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes filtration and snow and ice control.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2	
Use	Quantity	Value	Quantity	Value
Concrete aggregates 2/	909	4,640	1,880	7,860
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W
Road base and coverings 3/	1,760	4,990	1,460	5,190
Fill	161	323	2,330	4,450
Other miscellaneous uses 4/	44	75	41	186
Unspecified: 5/				
Actual	W	W	W	W
Estimated	1,600	5,240	21,600	55,000
Total	5,440	18,500	34,100	95,500
	District 3		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates 2/	622	3,100	--	--
Asphaltic concrete aggregates and other bituminous mixtures	419	3,010	244	1,310
Road base and coverings 3/	1,180	4,400	230	383
Fill	87	235	--	--
Other miscellaneous uses 4/	4	14	--	--
Unspecified: 5/				
Actual	1,510	6,730	859	1,420
Estimated	1,660	5,680	--	--
Total	5,490	23,200	1,330	3,120

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

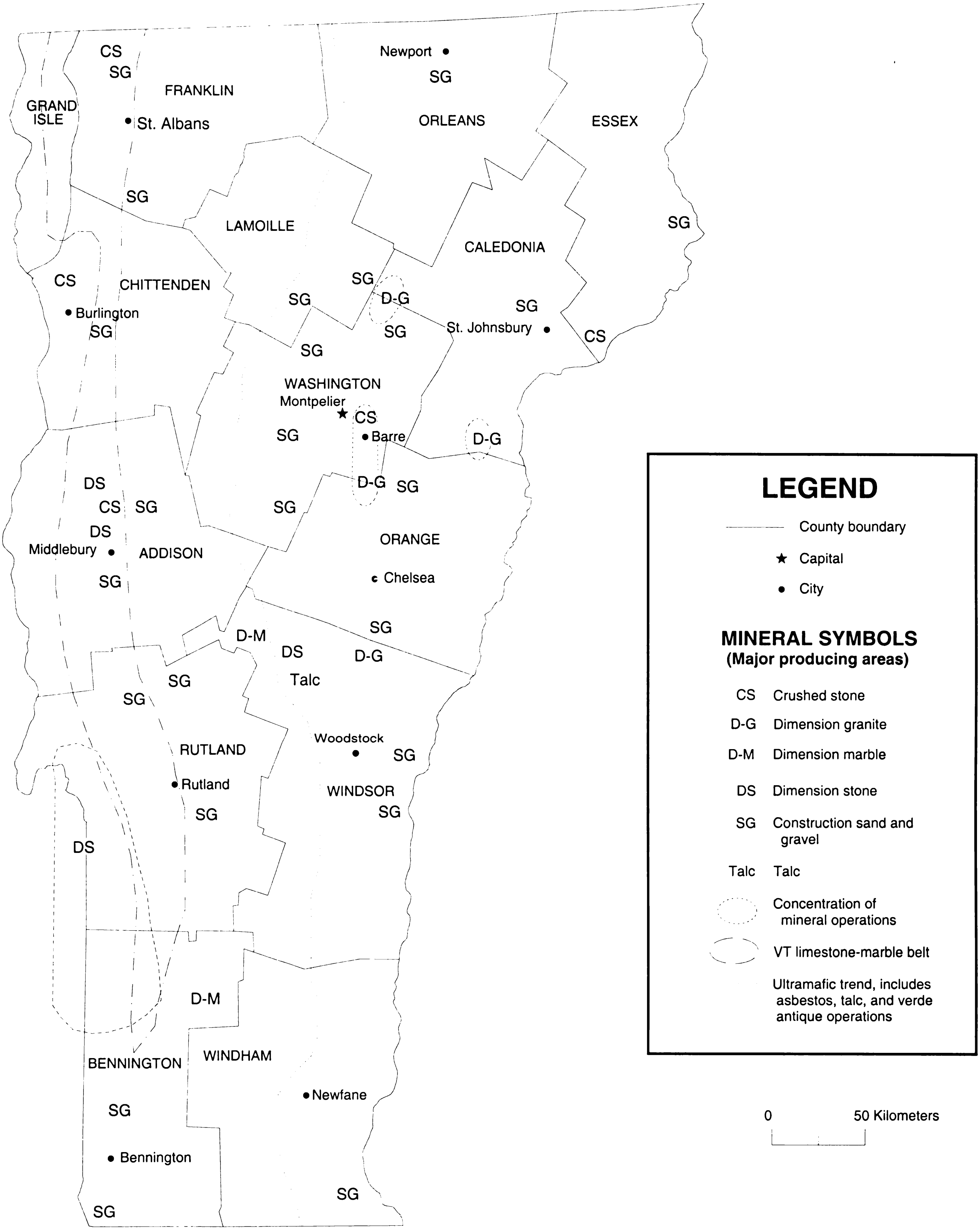
2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes snow and ice control.

5/ Reported and estimated production without a breakdown by end use.

VERMONT



Source: Vermont Geological Survey, Office of the State Geologist/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF VERMONT

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Vermont Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Vermont was $83.3 million, according to the U.S. Geological Survey (USGS). This was about a 12% increase compared with that of 1998,[2] and followed a 7.25% decrease from 1997 to 1998. Because data for talc have been withheld to protect company proprietary data, the actual total values for 1997 to 1999 are higher than those reported in table 1.

Dimension stone, Vermont's leading nonfuel mineral commodity in 1999, led the State's other nonfuel minerals with a $6.6 million increase (table 1). Construction sand and gravel and crushed stone followed with increases of about $1.3 million each. The production and value of talc decreased slightly while gemstones remained unchanged. Although construction sand and gravel rose $5.4 million and dimension stone was up $4.8 million in 1998, crushed stone went down $16 million, resulting in a net decrease for the year. Talc had a slight increase and gemstones remained unchanged.

Compared with USGS estimates of the quantities produced in the United States during 1999, Vermont remained second among the States that produced dimension stone and third among those producing talc.

The Vermont Geological Survey (VGS) provided the following narrative information.[3] Rock of Ages Corp., which actively quarries 13 dimension stone quarries throughout the United States and Canada, continued operations at Barre and Bethel. Demand for Barre Gray granite, the largest production dimensional stone that the company quarries, remained strong and the quarries were able to meet demands while building an inventory for the winter months. In Vermont, Rock of Ages typically closes down its quarries before Christmas and then reopens them in early March, as does the company at its quarries in the rest of the northeastern United States.

Demand for export of dimensional blocks continued to grow. The primary export markets for Rock of Ages are China and Europe. During 1999, the demand for Bethel White granite for export and domestic use was extremely high. The demand was such that the quarry remained open throughout the long and cold Vermont winter. Part of the demand was from growth in an order from the Little America Grand Hotel project in Salt Lake City, UT. The initial order was for 1,420 cubic meters (m^3) of stone. But by the end of the project Rock of Ages had quarried more than 2,270 m^3 owing to additions made to the project. The hotel will host international Olympic delegations for the 2002 Winter Olympics. Granites from Rock of Ages quarries were under consideration for numerous other projects. In the planning stages was an addition to the Kennedy Center for the Performing Arts in Washington, DC, that would use Bethel White granite. Overall, the dimensional stone business was very active, both domestically and overseas in 1999.

In other granite industry news, Barre Granite Quarries LLC, which has office in South Burlington, received an Act 250 (Vermont's Land Use and Development Law) land use permit in June 1999 for the reopening and expansion of an existing quarry in Sheffield. The company began quarry operations in 1999.

The VGS, which is also known as the Division of Geology and Mineral Resources in Vermont's Department of Environmental Conservation, conducts surveys and research of the geology, mineral resources, and topography of the State. Although recent emphasis has been on completion of the bedrock map of Vermont, the surficial mapping program, which began in 1996, was well underway. The first Vermont digital surficial maps were delivered to the USGS in 1999. Additionally, the VGS is in the process of using the surficial and bedrock data layers of the State's maps to customize HAZUS, which is the U.S. Federal Emergency Management Agency's Earthquake Loss Estimation Program's earthquake hazard computer program to make it realistically simulate local Vermont conditions.

The State Geologist manages interdisciplinary studies with strong geologic components, especially those focused on surface waters, groundwater resources, and geologic hazards. Review of projects as they relate to Criteria 9D and 9E of the aforementioned Act 250 is a VGS activity that recognizes the importance of lands with high potential for extraction of mineral and earth resources.

The VGS reviews and makes recommendations regarding mine and quarry reclamation plans in response to current environmental concerns. Published reports are prepared and made available to the public, consultants, industry, and government. The agency collates and disseminates this practical knowledge in packages ready for the consumer by providing geologic aid and advice to the public as required by State statute.

The VGS also provides advice concerning the development and working of rock and mineral deposits suitable for building, roadmaking, and economic purposes. An archive of old and new information is maintained by the VGS as per State statute.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Marjorie Gale, a Geologist with the Vermont Geological Survey, authored the State's minerals industry information.

In the event of any significant discovery of hydrocarbons in the State, the VGS provides geologic services for Vermont's Natural Gas and Oil Resources Board.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VERMONT 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	3,890	15,800	4,940	21,200	5,130	22,500
Stone:						
Crushed	7,840	44,500	5,590	28,500	5,700	29,800
Dimension metric tons	88,300	19,700	93,300	24,500	91,000	31,100
Total 3/	XX	80,000	XX	74,200	XX	83,300

p/ Preliminary. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Partial total, excludes value of talc that must be withheld to avoid disclosing company proprietary data.

TABLE 2
VERMONT: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	7	3,400	$11,900	$3.49	8	2,580	$11,400	$4.43
Dolomite	7	W	W	9.19	3	W	W	6.67
Granite	2	W	W	6.17	2	W	W	6.46
Marble	3	1,490	6,670	4.49	3	1,540	6,610	4.28
Quartzite	3	2,780	24,500	8.81	3	1,270	8,980	7.09
Slate	1	W	W	10.33	1	W	W	10.56
Total or average	XX	7,840	44,500	5.67	XX	5,590	28,500	5.10

W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
VERMONT: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	41	$248	$6.05
Filter stone	15	131	8.73
Other coarse aggregate	33	309	9.36
Coarse aggregate, graded:			
Concrete aggregate, coarse	144	1,350	9.38
Bituminous aggregate, coarse	W	W	9.24
Bituminous surface-treatment aggregate	W	W	8.04
Railroad ballast	W	W	8.23
Other graded coarse aggregate	396	3,440	8.68
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	189	1,340	7.07
Screening, undesignated	42	265	6.31
Coarse and fine aggregates:			
Graded road base or subbase	349	2,460	7.04
Unpaved road surfacing	139	1,100	7.88
Crusher run or fill or waste	196	684	3.49
Other coarse and fine aggregates	9	80	8.89
Other construction materials	5	19	3.80
Unspecified: 3/			
Actual	550	2,340	4.25
Estimated	3,480	14,800	4.24
Total or average	5,590	28,500	5.10

W Withheld to avoid disclosing company proprietary data; included with "Other graded coarse aggregate."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, granite, limestone, marble, quartzite, and slate.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
VERMONT: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	602	$3,650	$6.06
Plaster and gunite sands	8	71	8.88
Asphaltic concrete aggregates and other bituminous mixtures	259	1,360	5.25
Road base and coverings	1,370	6,060	4.42
Fill	147	368	2.50
Snow and ice control	240	935	3.90
Railroad ballast	39	106	2.72
Other miscellaneous uses 3/	212	1,450	6.85
Unspecified: 4/			
Actual	230	1,090	4.75
Estimated	1,830	6,110	3.33
Total or average	4,940	21,200	4.29

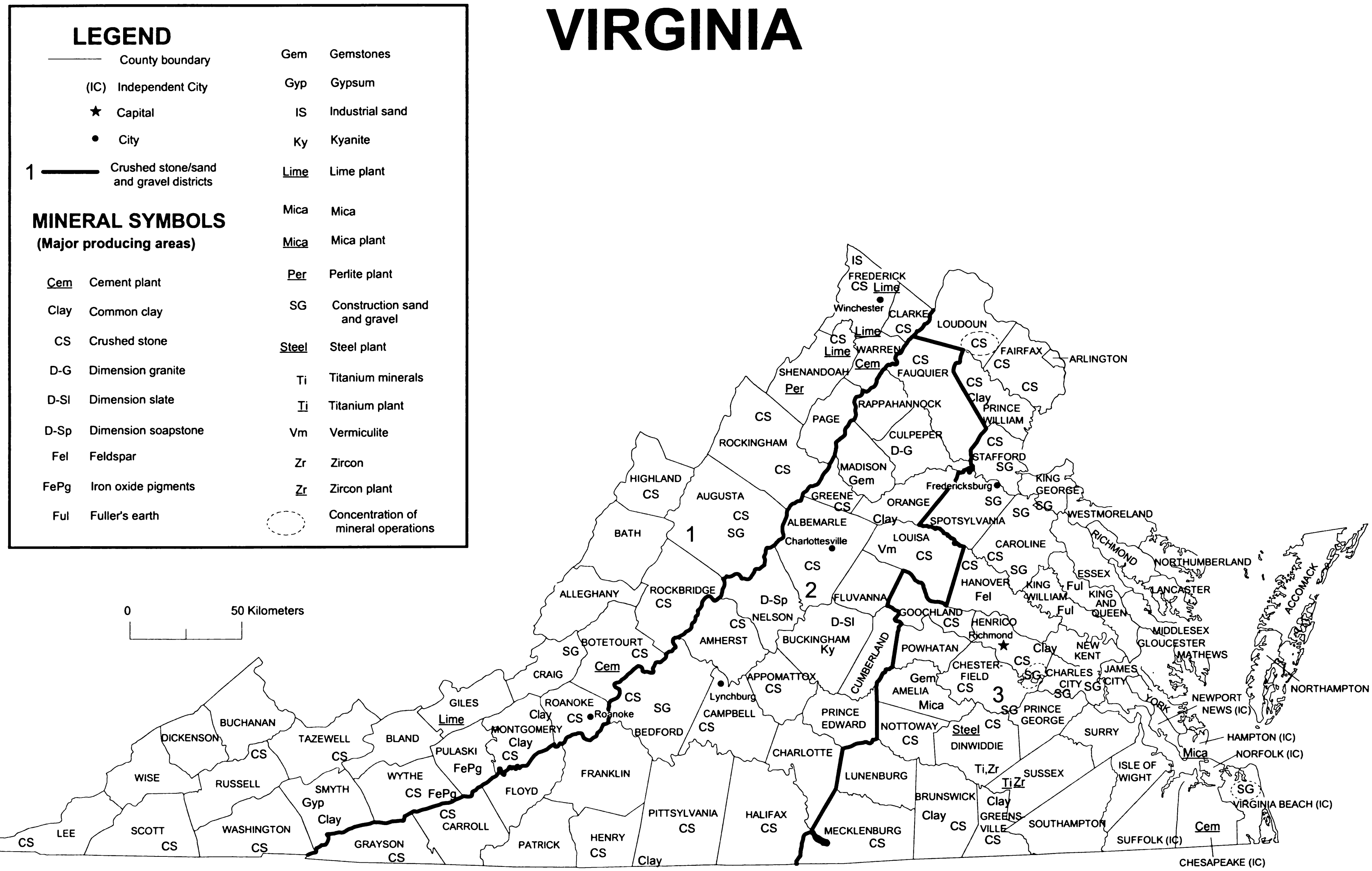
1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Includes filtration and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

VIRGINIA



Source: Virginia Department of Mines, Minerals and Energy/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Virginia Department of Mines, Minerals and Energy for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Virginia was $667 million, according to the U.S. Geological Survey (USGS). This was a 5% increase from that of 1998,[2] and followed a 7.6% increase from 1997 to 1998. For the fourth consecutive year, Virginia was 22d in rank among the 50 States in total nonfuel mineral production value, of which the State accounted for more than 1.5% of the U.S. total.

Crushed stone, Virginia's leading nonfuel mineral, accounted for 61% of the State's total value (table 1). From 1990 through 1998, Virginia produced more than 558 million metric tons of crushed stone, or an average of almost 56 million metric tons per year. In 1999, the increased values of crushed stone (up $17 million), zirconium concentrates (up more than $5 million), and construction sand and gravel and lime (each up $2.5 million) accounted for a large majority of the State's increase. Portland cement, feldspar, vermiculite, masonry cement, and titanium concentrates (from ilmenite) had smaller yet significant increases; talc, gypsum, and gemstones values also rose slightly (all in descending order of change). There were no significant decreases in value for any mineral commodity. In 1998, crushed stone with a $13 million increase, fuller's earth rising almost as much, and significant increases for titanium concentrates and portland cement accounted for a large majority of the State's increase in value. Smaller yet significant increases also occurred in the values of lime and construction sand and gravel, whereas decreases totaling about $9 million occurred in kyanite, dimension stone, masonry cement, and vermiculite.

Based upon USGS estimates of quantities produced in the 50 States during 1999, Virginia remained the only State to mine kyanite; second in feldspar, second of 2 States that produce titanium concentrates, zircon concentrates and vermiculite; seventh in fuller's earth; eighth in lime; and ninth in crushed stone. The State decreased from fifth to sixth in iron oxide pigments. It also produced significant quantities of construction sand and gravel and common clays. Although the only producing kyanite mine and calcined kyanite (mullite) facilities in the United States were in Virginia, synthetic mullite, which is a calcined bauxite, was produced in one other State. About 90% of the U.S. kyanite and mullite output is used in refractories for the smelting and processing of a variety of metals and in glass and high-temperature ceramics manufacturing.

The following narrative information was provided by the Virginia Division of Mineral Resources[3] (VDMR).

In late summer 1999, RGC (USA) Mineral Sands Inc. became Iluka Resources Inc., Virginia, Old Hickory Operations. The company continued titanium mining and initial processing operations in Dinwiddie County and final processing near the town of Stony Creek, Sussex County. From the commencement of operations in fall 1997 through the end of 1998 the company produced 203,000 metric tons (t) of titanium and zirconium concentrates.

W.W. Boxley's Blue Ridge Stone Corp. was granted a State permit to quarry limestone for roadstone at the Santana Plant, which is located north of Fincastle, Botetourt County. Vulcan Materials Co. received a State permit to reopen the Cashion quarry in Chesterfield County, which is southwest of Richmond; granitic rock will be crushed to produce roadstone. The Shooting Creek Quarry, LLC, obtained a State permit in late 1998 to reopen the quarry (formerly operated by Pine Creek Stone Co.), which is about 3 miles east of Floyd, Floyd County. The company began quarrying and processing amphibolite in early 1999; the main product from the operation is roadstone, which is transported by truck. In late 1998, Luck Stone Corp. acquired Smith Sand and Gravel Co.'s operation in Caroline County northeast of Richmond. The company will operate as the Caroline Plant of Luck Stone Corp.

Golden Cat, a Division of Ralston Purina Co., continued producing cat box litter at its manufacturing plant, which is located about 40 kilometers northeast of Richmond in King William County. At its on-site mining operation, 136,000 t of raw clay material has been mined between its opening in the late summer of 1997 through the end of 1998.

The New World Stone Co. began operating the former Tulikivi soapstone plant at Schuyler, Nelson County, in November 1998. The company continued to use existing soapstone blocks to produce sculpture, etc., for special orders.

PCS Phosphates, Inc., closed its defluorinating plant in Saltville, Smyth County, on August 31, 1999. The closure was due to the high cost of transporting raw materials from Aurora, NC, and the cost of removing waste products from the facility.

U.S. Gypsum Co. closed its Locust Cove gypsum mine and its wallboard plant in Smyth and Washington Counties. The closing, which was initially planned for May 1999, was delayed to near yearend owing to high demand for the wallboard product manufactured in the Saltville plant. The main reasons for closing were that it was a "high-cost plant" and that the plant was not close to its major markets.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Palmer C. Sweet, Head Geologist with the Virginia Division of Mineral Resources, authored the text of mineral industry information submitted by that agency.

In 1999, Gold Crown Mining Co. continued to permit and work intermittently the old Kentuck Mine, east of Danville, Pittsylvania County, for small amounts of gold. Southern Piedmont Mining Co. continued to permit the old Moss gold mine in Goochland County, although no processing of ore was reported from the company's permitted site near the Goochland-Fluvanna County line.

Government Activities and Programs

During the latter part of the year, the Governor of Virginia proposed a transportation spending program of $2.5 billion. Most of the funds were targeted for fast-growing, "traffic-choked" northern Virginia. The Governor appointed the Commission on Transportation Policy to make interim recommendations by December 1999 and final recommendations by the end of 2000.

The VDMR continued its geologic mapping of several counties at a detailed 1:24,000 scale, mapping and compiling 1:100,000-scale maps, and digitizating its 1:24,000- and 1:100,000-scale maps. Field studies and compilation of mineral resources on 1:24,000-scale maps continued, and a project to prepare county geology and mineral resources data also was underway. During 1999, reports were published on the statistics of industrial and metallic mineral resources, coal, oil and gas produced in the State in 1998, and 53-million-year-old vertebrates and plants from the Fisher/Sullivan site in Stafford County. Also published were articles in the quarterly *Virginia Minerals* on the geology of the Culpeper basin, vein quartz, mineral resources in comprehensive planning, and a Mammoth tooth found in Endless Caverns.

An ambitious program to digitize all previously published VDMR geologic maps continued with all the maps at some stage of completion. In a separate program, plans were being made to scan all the reports the agency has published since 1905. These will be made available as Portable Document Format (PDF) files on CD-ROM. Aside from the convenience of having all the maps and reports available in digital form, previously out-of-print publications will be available.

The Geologic Map of Virginia (1:500,000 scale), which was fully digitized and in the final stages of editing, was being prepared to be published on CD-ROM as a color raster image accompanied by digital vector data in a variety of standard formats; for example, ARC/INFO, ArcView, and Auto CAD. Additionally, the digital Geologic Map of Virginia was being processed for presentation on the Internet as a set of interactive maps using MapGuide software.

In cooperation with Radford University, the VDMR produced and released a CD-ROM "The Geology of Virginia," which describes the basics of rocks, minerals, fossils, etc. It emphasizes the Virginia Standards of Learning in Earth Science and is accompanied by a Teacher's Guide. This is the first of a planned set of four CD-ROM's, the remaining three of which will address the detailed geology of the physiographic provinces.

The Mineral Resources of Virginia data base, which contains location and identification information on mines, quarries, prospects, pits, and occurrences, is being updated as field work is completed. Checking and verification of data is also being accomplished as the project continues. In four counties, pilot projects to develop water-well data bases were underway in an effort to establish the relation between bedrock geology and well yields.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN VIRGINIA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Clays: Common	830	3,160	872	3,310	877	3,240
Kyanite	W	W	90	13,200	90	13,000
Lime	818	49,300	859	51,700	900	54,200
Sand and gravel: Construction	10,700	52,700	11,900	54,800	12,100	57,300
Stone:						
Crushed	61,300 r/	377,000 r/	65,900	390,000	67,000	407,000
Dimension	W	W	5,430	600	4,880	595
Combine values of cement, clays (fuller's earth), feldspar, gemstones, gypsum (crude), iron oxide pigments (crude), sand and gravel (industrial), stone [dimension dolomite, granite, slate, and traprock (1997)], talc and pyrophyllite (1997, 1999), vermiculite, zirconium concentrates (1998-99), and values indicated by symbol W	XX	109,000	XX	122,000	XX	132,000
Total	XX	591,000 r/	XX	636,000	XX	667,000

p/ Preliminary. r/ Revised. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 2
VIRGINIA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	41	15,700	$93,500	$5.97	44	18,500	$103,000	$5.56
Dolomite	10	4,880	33,700	6.92	10	3,800	22,600	5.96
Granite	38	27,000 r/	167,000 r/	6.17 r/	39	28,600	186,000	6.50
Sandstone and quartzite	6	1,410	8,460	6.00	8	2,460	12,000	4.90
Traprock	9 r/	11,200 r/	63,300 r/	5.64 r/	9	11,400	59,300	5.22
Slate	2	W	W	18.61 r/	1	W	W	6.07
Miscellaneous stone	3	W	W	6.44 r/	4	W	W	6.25
Total or average	XX	61,300 r/	377,000 r/	6.14 r/	XX	65,900	390,000	5.92

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

TABLE 3
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	394	$1,360	$3.44
Riprap and jetty stone	1,180	8,790	7.46
Filter stone	710	4,180	5.88
Other coarse aggregate	608	4,070	6.70
Coarse aggregate, graded:			
Concrete aggregate, coarse	7,530	47,100	6.25
Bituminous aggregate, coarse	4,090	28,400	6.94
Bituminous surface-treatment aggregate	2,140	16,600	7.75
Railroad ballast	552	3,060	5.54
Other graded coarse aggregate	2,180	14,000	6.41
Fine aggregate (-3/8 inch):			
Stone sand, concrete	485	3,160	6.52
Stone sand, bituminous mix or seal	1,070	6,370	5.94
Screening, undesignated	2,170	11,100	5.11
Other fine aggregate	1,200	6,400	5.35
Coarse and fine aggregates:			
Graded road base or subbase	8,490	50,200	5.92
Unpaved road surfacing	562	3,050	5.43
Terrazzo and exposed aggregate	W	W	4.00
Crusher run or fill or waste	4,450	22,600	5.08
Other coarse and fine aggregates	1,880	8,940	4.77
Other construction materials	5	23	4.60
Agricultural:			
Agricultural limestone	453	3,310	7.30
Poultry grit and mineral food	W	W	10.34
Other agricultural uses	156	1,580	10.10
Chemical and metallurgical:			
Cement manufacture	W	W	4.41
Lime manufacture	W	W	4.41
Chemical stone	W	W	3.85
Glass manufacture	30	233	7.77
Other chemical and metallurgical	2,470	10,900	4.40
Special:			
Mine dusting or acid water treatment	(3/)	(3/)	3.33
Asphalt fillers or extenders	144	710	4.93
Other fillers or extenders	(3/)	(3/)	7.54
Other miscellaneous uses:			
Waste material	(3/)	(3/)	4.60
Other specified uses not listed	2	10	4.95
Unspecified: 4/			
Actual	16,700	98,400	5.88
Estimated	6,110	35,200	5.76
Total or average	65,900	390,000	5.92

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to

2/ Includes dolomite, granite, limestone, limestone-dolomite, miscellaneous stone, sandstone-quartzite, slate, and traprock.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	1,050	5,230	357	2,790	1,520	10,800
Coarse aggregate, graded 3/	4,530	27,400	2,290	17,500	9,770	65,100
Fine aggregate (-3/8 inch) 4/	1,630	8,740	663	4,550	2,640	13,800
Coarse and fine aggregate 5/	4,530	21,500	2,500	14,500	8,500	50,100
Other construction materials	W	W	W	W	W	W
Agricultural 6/	594	4,760	W	W	W	W
Chemical and metallurgical 7/	2,500	11,100	--	--	--	--
Special 8/	W	W	--	--	--	--
Other miscellaneous uses	--	--	W	W	W	W
Unspecified: 9/						
Actual	1,200	7,280	4,680	27,900	W	W
Estimated	4,850	27,800	1,260	7,360	--	--
Total	21,100	115,000	11,800	74,800	33,000	201,000

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing, and other coarse and fine aggregates.

6/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

7/ Includes cement manufacture, chemical stone or alkali works, glass manufacture, and lime manufacture.

8/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, and other fillers or extenders.

9/ Reported and estimated production without a breakdown by end use.

TABLE 5
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	5,550	$30,500	$5.50
Concrete products (blocks, bricks, pipe, decorative, etc.)	200	1,870	9.36
Asphaltic concrete aggregates and other bituminous mixtures	727	3,990	5.48
Road base and coverings	845	1,850	2.19
Fill	2,030	4,120	2.04
Snow and ice control	55	305	5.55
Other miscellaneous uses	151	1,020	6.72
Unspecified: 3/			
Actual	851	4,750	5.58
Estimated	1,460	6,420	4.41
Total or average	11,900	54,800	4.63

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	W	W	W	W	5,150	27,600
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	--	--	199	1,870
Asphaltic concrete and road base materials	106	769	108	592	1,270	3,990
Fill	2	13	(3/)	1	2,020	4,110
Snow and ice control	W	W	W	W	41	199
Other miscellaneous uses	2	14	(3/)	1	151	1,010
Unspecified 4/	233	1,050	110	749	1,960	9,370
Total	782	5,030	267	1,650	10,800	48,200

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

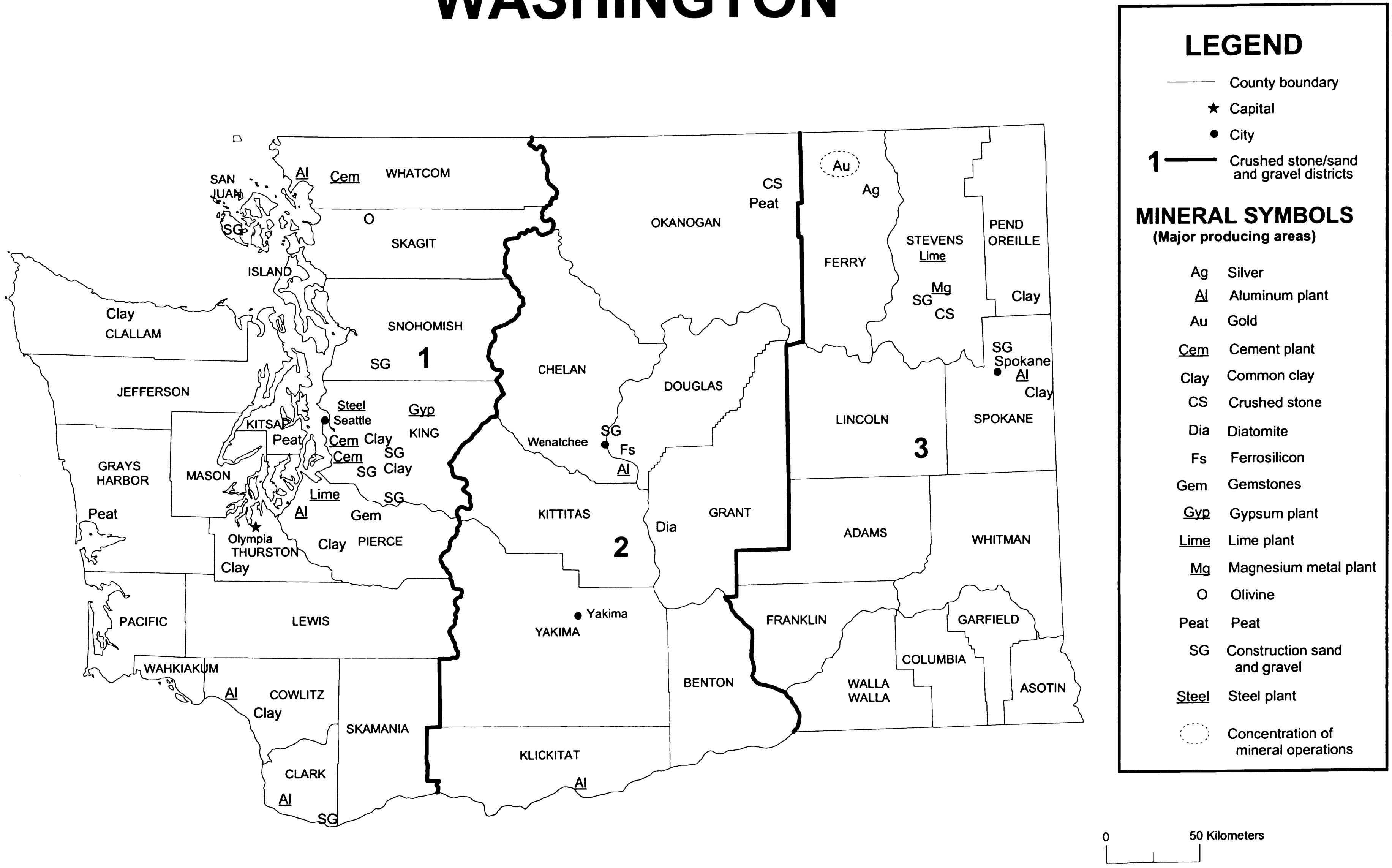
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Less than ½ unit.

4/ Reported and estimated production without a breakdown by end use.

WASHINGTON



Source: Washington State Division of Geology and Earth Resources/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF WASHINGTON

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Washington State Department of Natural Resources, Division of Geology and Earth Resources, for collecting information on all nonfuel minerals.

In 1999 the preliminary estimated value[1] of nonfuel mineral production for Washington was $631 million, according to the U.S. Geological Survey (USGS). This was about a 4% increase from that of 1998,[2] and followed a 9.7% increase from 1997 to 1998. The State remained 23d in the Nation in total nonfuel mineral production, of which Washington accounted for about 2% of the U.S. total.

The following three mineral commodities, in descending order of value, accounted for about 68% of the State's nonfuel mineral value: construction sand and gravel, crushed stone, and portland cement. In 1999, the rise in value resulted mainly from a $30 million increase in the value of crushed stone and a substantial increase in the value of magnesium metal. Smaller yet significant increases also occurred in portland cement and lime. These gains were offset, in part, by decreases of about $21 million and about $5 million in construction sand and gravel and gold, respectively, plus a smaller yet significant decrease in the value of diatomite (table 1). In 1998, most nonfuel minerals increased in value, led by construction sand and gravel, up $34 million, and crushed stone, up about $19 million. Smaller yet significant increases also occurred in magnesium metal, portland cement, olivine, lime, common clays, and diatomite (table 1). Only gold, down $9.6 million, showed any significant decrease for the year. All other changes in 1998 and 1999 were small and inconsequential to the net result.

Based upon USGS estimates of the quantities produced in the 50 States in 1999, Washington remained first of 2 olivine-producing States; fourth of 4 diatomite-producing States; and ninth in gold. The State was second of two magnesium-metal-producing States, dropped from seventh to eighth in the production of construction sand and gravel, and was a significant producer of crushed stone. In 1999, Washington continued to lead the Nation in the production of primary aluminum with an estimated 1.15 million metric tons (Mt). The State accounted for more than 30% of the U.S. total primary aluminum production. Raw steel was also produced in the State. Primary aluminum and raw steel were processed from materials received from other foreign and domestic sources.

The Washington State Division of Geology and Earth Resources[3] (DGER) provided the following narrative information. Production data in the text that follows are those reported by the DGER and are based on the agency's own surveys and estimates. They may differ from some production figures reported to the USGS.

Significant highlights for 1999 included Washington's major metal mining operations at Echo Bay Minerals Co.'s K-2 and Lamefoot gold deposits and preparation of a draft environmental impact statement (EIS) to reestablish mining for zinc and lead at the Pend Oreille Mine. The only known major mineral exploration projects for metallic minerals in Washington in 1999 were for additional reserves in and adjacent to the K-2 and Lamefoot gold deposits and at the Pend Oreille Mine.

Echo Bay's Kettle River Project near Republic, Ferry County, mined and produced gold that contained a small amount of silver from the K-2 and the Lamefoot gold deposits. The majority of the silver came from the K-2 deposit. In 1999, the Lamefoot deposit produced 2,290 kilograms (kg) of gold from 346,185 metric tons (t) of ore. Reserves at the Lamefoot deposit will be depleted in January 2001. The K-2 deposit, which will become the major gold mine for the Kettle River Project, produced 1,748 kg of gold from 233,381 t of ore in 1999. Exploration for reserves to replace those being mined in 1999 was concentrated in and around the K-2 deposit. Combined production from the two deposits, which was processed at the Echo Bay mill near the Overlook deposit, was 4,040 kg of gold from 579,565 t of ore. The Lamefoot deposit is an exhalative/replacement-type deposit in Permian rocks, and the K-2 deposit is an epithermal vein-type deposit in Eocene volcanic rocks. Both deposits are in the same geologic formation (Derkey and Hamilton, 2000).

Cominco American Inc. announced an ore reserve of 5.5 Mt at the Pend Oreille Mine, a Mississippi-Valley type zinc-lead deposit in northern Pend Oreille County (accessed 2/7/2001 at URL http://www.cominco.com/explore/Orereser.htm). The company will ship zinc and lead concentrates to its smelter in Trail, British Columbia. Startup was anticipated to be in 2002, possibly sometime after closure of the parent company's Sullivan Mine in nearby British Columbia.

The Crown Jewel gold deposit near Chesaw in Okanogan County is a skarn-type gold deposit in a sequence of Pennsylvanian to possibly Triassic clastic and carbonate sedimentary rocks. Previously announced reserves for the deposit were 7.9 Mt of ore at a grade of 6.38 grams per metric ton of gold. These rocks contain more than 50 t of gold. Battle Mountain Gold Co., which was the operator, prepared an EIS that was released in February 1997. The company has been working to obtain permits to mine the deposit ever since.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Robert E. Derkey, Geologist, authored the text of mineral industry information submitted by the Washington State Division of Geology and Earth Resources.

Northwest Alloys Inc. mined dolomite near Addy, Stevens County, for magnesium metal production and road aggregate in 1999. A total of 500,000 t was sent to the smelter, and approximately 140,000 t of waste rock was used for road aggregate. Northwest Alloys also used some of the byproducts from smelting for fertilizer and soil conditioners.

In the industrial minerals industry, limestone (calcium carbonate) and dolomite (calcium magnesium carbonate) were used in soil conditioners and in animal feeds. Pacific Calcium Inc., produced from the Tonasket and Brown quarries in Okanogan County, and Allied Minerals, Inc., produced from the Gehrke quarry in Stevens County. Columbia River Carbonates continued to produce calcium carbonate from the Wauconda quarry. The company was looking for an alternate source of high-brightness limestone closer to its processing plant in Longview, Cowlitz County. Northport Limestone Co. mined carbonate from the Sherve quarry in Stevens County and shipped most of it to Trail, British Columbia, for use as a fluxing agent in smelting. Northwest Marble Products continued to produce color- and site-specific carbonate products for terrazzo tile and related uses.

Olivine Corp. mined 43,500 t of refractory-grade olivine from its Swen Larsen Quarry in Whatcom County in 1999. Of that total, Olivine Corp. shipped 43,000 t to Unimin Corp., a Belgian company that produced casting sands and other refractory products at Hamilton, in Skagit County (Derkey and Hamilton, 2000).

Much of the clay produced in western Washington was mined by or for Ash Grove Cement Co. and LaFarge Corp. for use in cement. Ash Grove Cement Co. mined 5,500 t of clay from its Castle Rock quarry, LaFarge Corp. mined 28,880 t of clay from the Twin River quarry, and Pacific Coast Coal Co. mined a clay interbed from the John Henry #1 coal mine and shipped almost 6,400 t to Ash Grove Cement Co.

Mutual Materials Co. continued to mine clay for the manufacture of bricks and related products. It mined at the Mica pit in Spokane County, at the Usk pit in Pend Oreille County, and at the Elk and Section 31 pits in King County. Mutual Materials also shipped stockpiled clay from the Clay City pit in Pierce County.

Celite Corp. mined and processed 84,404 t from diatomite pits in Grant County. The company shipped 55,662 t of finished diatomite.

Lane Mountain Silica Co. mined 250,373 t of Addy Quartzite from the Lane Mountain quarry in Stevens County. Following processing, the company shipped 197,484 t of high-purity quartz, most of which was used to manufacture clear glass bottles and jars. Approximately 20% of the ore was removed during processing. This waste material, which had accumulated over a number of years, was being shipped to Richmond, British Columbia, and was used to manufacture cement. Lane Mountain agglomerated the fine-grained siliceous waste material into small lumps by mixing a small amount of cement with it prior to shipping to avoid massive solidification during rail transport.

Reserve Silica Corp. mined 63,000 t of quartz-rich Puget Group sands from the Ravensdale pit in King County. Most of Reserve Silica's production was used for the manufacture of colored bottle glass. Ash Grove Cement Co. mined nearly 118,000 t of silica from its Superior quarry in King County. The company used the silica for making cement. The James Hardy Building Products Co. mined 91,000 t of silica from its Scatter Creek Mine in King County, which it used to manufacture Hardy Board products (Derkey and Hamilton, 2000).

Reference Cited

Derkey, R.E. and Hamilton, M.M., 2000, Annual review 1999: Mining Engineering, v. 52, no. 5, May, p. 101-102.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WASHINGTON 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1997		1998		1999 p/	
		Quantity	Value	Quantity	Value	Quantity	Value
Cement: Portland		1,210	92,400 e/	1,200	95,500 e/	1,230	98,000 e/
Clays: Common		165	715	178	W	180	W
Gemstones		NA	23	NA	24	NA	30
Gold 3/	kilograms	4,040	43,200	3,540	33,600	3,190	28,700
Gypsum, crude		12	549	--	--	--	--
Sand and gravel: Construction		40,500	180,000	45,700	214,000	40,500	193,000
Silver 3/	metric tons	2	285	1	102	W	W
Stone: Crushed		14,700	92,200	19,400	111,000	24,000	141,000
Combined values of cement (masonry), diatomite, lime, magnesium metal, olivine, peat, sand and gravel (industrial), stone (dimension miscellaneous), and values indicated by symbol W		XX	146,000	XX	156,000	XX	170,000
Total		XX	555,000	XX	609,000	XX	631,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable. -- Zero.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Recoverable content of ores, etc.

TABLE 2
WASHINGTON: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	7 r/	1,460 r/	$19,200 r/	$13.15 r/	14	997	$6,080	$6.11
Dolomite	3	463	2,010	4.35	3	569	2,580	4.53
Limestone-dolomite	2	W	W	32.10	2	W	W	6.29
Granite	3	417	2,330	5.60	3	399	2,350	5.90
Marble	--	--	--	--	1	W	W	5.52
Sandstone	4	604	5,660	9.37	6	788	8,220	10.44
Shell	1	W	W	6.25	3	W	W	2.74
Traprock	87	11,000 r/	57,900 r/	5.28 r/	101	15,000	83,000	5.54
Volcanic cinder and scoria	2	W	W	6.95	2	200	1,120	5.61
Miscellaneous stone	8	571	2,810	4.93	9	820	4,460	5.44
Total or average	XX	14,700	92,200	6.25	XX	19,400	111,000	5.74

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$5.89
Riprap and jetty stone	1,050	$6,690	6.35
Filter stone	75	310	4.13
Other coarse aggregate	568	4,320	7.60
Coarse aggregate, graded:			
Concrete aggregate, coarse	W	W	7.39
Bituminous aggregate, coarse	72	299	4.15
Bituminous surface-treatment aggregate	30	138	4.60
Railroad ballast	733	3,000	4.09
Other graded coarse aggregate	1,120	7,910	7.07
Fine aggregate (-3/8 inch):			
Stone sand, concrete	2	8	4.18
Stone sand, bituminous mix or seal	W	W	2.99
Screening, undesignated	73	287	3.94
Other fine aggregate	82	619	7.55
Coarse and fine aggregates:			
Graded road base or subbase	3,530	20,500	5.81
Unpaved road surfacing	1,570	7,030	4.47
Terrazzo and exposed aggregate	219	1,310	5.98
Crusher run or fill or waste	983	3,960	4.03
Other construction materials	51	602	11.80
Agricultural:			
Agricultural limestone	W	W	4.07
Other agricultural uses	32	113	3.53
Chemical and metallurgical:			
Cement manufacture	119	196	1.65
Lime manufacture	W	W	5.52
Flux stone	W	W	14.08
Glass manufacture	W	W	20.48
Other chemical and metallurgical	399	5,250	13.16
Special:			
Mine dusting or acid water treatment	(3/)	2	W
Asphalt fillers or extenders	(3/)	1	W
Whiting or whiting substitute	(3/)	1	W
Other fillers or extenders	W	W	13.88
Roofing granules	W	W	3.68
Other special uses	115	1,590	13.79
Other miscellaneous uses: Other specified uses not listed	14	62	4.43
Unspecified: 4/			
Actual	4,240	25,300	5.96
Estimated	4,290	21,700	5.06
Total or average	19,400	111,000	5.79

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, marble, miscellaneous stone, sandstone, shell, traprock, and volcanic cinder and scoria.

3/ Less than ½ unit.

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
WASHINGTON: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	1,500	10,400	--	--	131	587	65	284
Coarse aggregate, graded 3/	1,260	8,740	10	41	636	2,400	45	175
Fine aggregate (-3/8 inch) 4/	80	614	69	269	7	31	--	--
Coarse and fine aggregate 5/	4,670	26,600	160	962	201	1,010	1,270	4,200
Other construction materials	W	W	--	--	W	W	--	--
Agricultural 6/	--	--	W	W	W	W	--	--
Chemical and metallurgical 7/	W	W	--	--	W	W	--	--
Special 8/	--	--	W	W	W	W	--	--
Other miscellaneous uses	W	W	1	6	W	W	--	--
Unspecified: 9/								
Actual	1,260	7,380	930	5,640	1,710	10,400	339	1,870
Estimated	3,560	18,300	172	902	560	2,470	--	--
Total	12,700	73,400	1,480	9,470	3,520	21,700	1,720	6,530

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregates, unpaved road surfacing.

6/ Includes agricultural limestone and other agricultural uses.

7/ Includes cement manufacture, flux stone, glass manufacture, and lime manufacture.

8/ Includes asphalt fillers or extenders, mine dusting or acid water treatment, whiting or whiting substitute, other fillers or extenders, and roofing granules.

9/ Reported and estimated production without a breakdown by end use.

TABLE 5
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	10,100	$63,400	$6.31
Plaster and gunite sands	69	482	6.99
Concrete products (blocks, bricks, pipe, decorative, etc.)	175	1,170	6.66
Asphaltic concrete aggregates and other bituminous mixtures	2,770	13,100	4.71
Road base and coverings	7,160	34,500	4.82
Fill	5,260	18,500	3.53
Snow and ice control	216	768	3.56
Railroad ballast	198	1,110	5.61
Other miscellaneous uses 2/	246	736	2.99
Unspecified: 3/			
Actual	6,310	20,600	3.25
Estimated	13,200	59,200	4.48
Total or average	45,700	214,000	4.68

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes filtration.

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
WASHINGTON: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		Unspecified districts 2/	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	9,570	61,800	657	2,830	71	408	--	--
Asphaltic concrete aggregates and other bituminous mixtures	2,330	11,300	380	1,570	66	192	--	--
Road base and coverings	5,700	29,400	533	2,250	929	2,830	--	--
Fill	4,990	17,700	235	760	33	86	--	--
Snow and ice control	126	463	24	133	66	172	--	--
Other miscellaneous uses 4/	285	1,280	149	512	9	61	--	--
Unspecified: 5/								
Actual	1,390	6,290	880	3,100	3,580	10,400	475	785
Estimated	9,960	46,700	2,680	10,20	578	2,390	--	--
Total	34,300	175,000	5,540	21,30	5,330	16,500	475	785

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

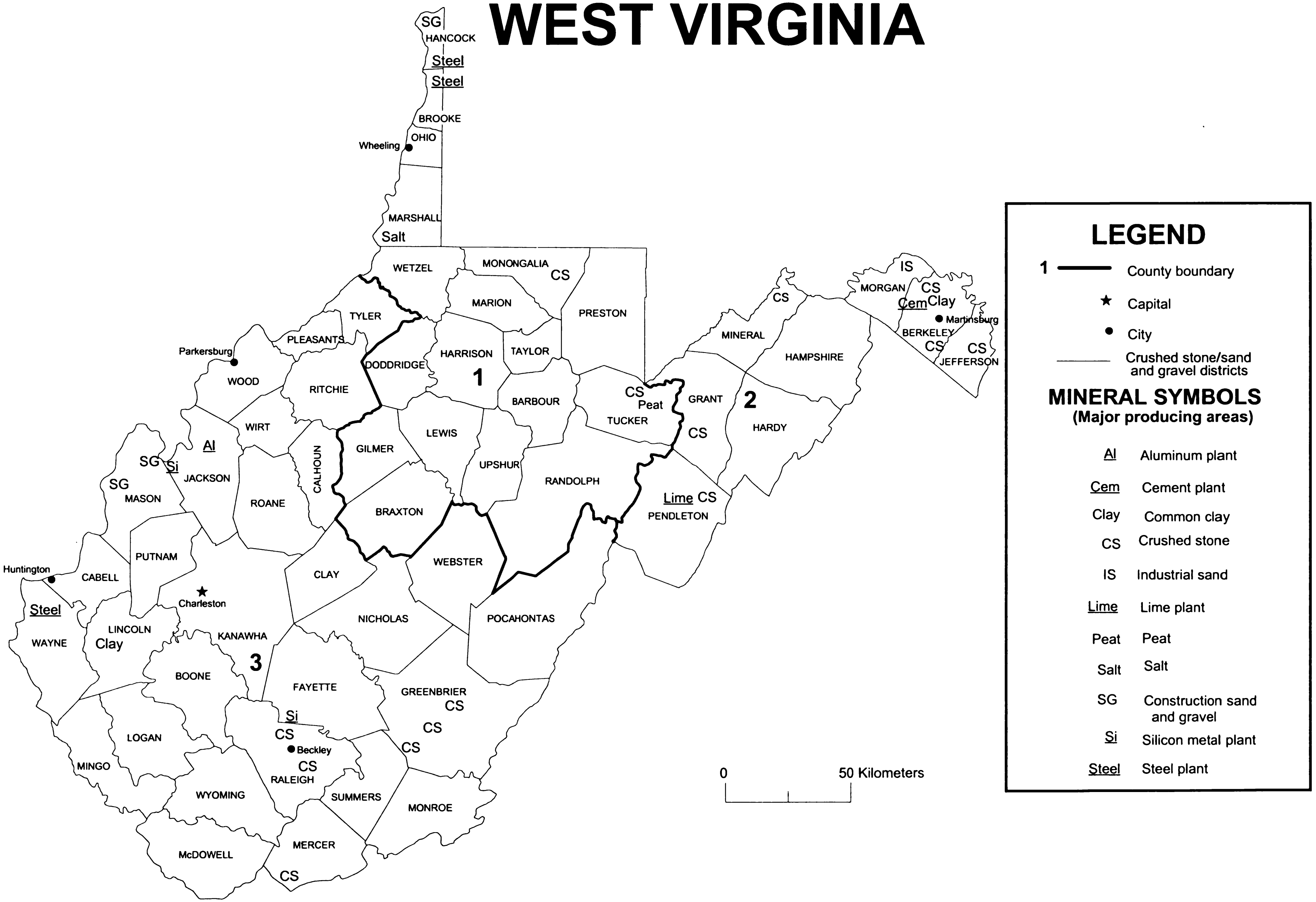
2/ Includes production within the State with no district reported.

3/ Includes plaster and gunite sands.

4/ Includes filtration and railroad ballast.

5/ Reported and estimated production without a breakdown by end use.

WEST VIRGINIA



Source: West Virginia Geological and Economic Survey/U.S. Geological Survey (1998)

THE MINERAL INDUSTRY OF WEST VIRGINIA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the West Virginia Geological and Economic Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for West Virginia was $180 million, according to the U.S. Geological Survey (USGS). This was about a 6% increase from that of 1998,[2] and followed a 17.1% decrease from 1997 to 1998.

Crushed stone was West Virginia's leading nonfuel mineral by value and represented 42% of the State total. Portland cement, industrial sand and gravel, lime, and salt, in descending order of value, followed. These top five mineral commodities accounted for 89% of the State's total nonfuel mineral production value. In 1999, a $7 million increase in the value of crushed stone and a more than $2 million rise in the value of construction sand and gravel led the State's increase. The large majority of the drop in value in 1998 resulted from decreases in crushed stone and masonry and portland cement (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States in 1999, West Virginia remained 9th in salt; the State also produced significant quantities of cement, crushed stone, and industrial sand and gravel. West Virginia mines produced only industrial minerals and coal; no metals were mined in the State. Primary aluminum and raw steel were produced in West Virginia, but both metals were processed from materials acquired from foreign and other domestic sources. In 1999, West Virginia ranked 13th in the Nation in the production of primary aluminum.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WEST VIRGINIA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays: Common	151	323	231	515	234	513
Gemstones	NA	1	NA	1	NA	1
Sand and gravel: Construction	1,670	8,010	1,650	8,050	2,080	10,400
Stone: Crushed 3/	12,900	76,700	12,300	68,100	13,200	75,100
Combined values of cement, lime, peat, salt, sand gravel (industrial), stone (crushed dolomite dimension sandstone)	XX	120,000	XX	93,000	XX	93,700
Total	XX	205,000	XX	170,000	XX	180,000

p/ Preliminary. NA Not available. XX Not applicable.
1/ Production as measured by mine shipments or marketable production (including consumption by producers).
2/ Data are rounded to no more than three significant digits; may not add to totals shown.
3/ Excludes certain stones; kind and value included with "Combined values" data.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

TABLE 2
WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	38	12,000	$70,500	$5.86	38	11,300	$61,400	$5.45
Dolomite	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Sandstone	8	856	6,180	7.22	9	1,020	6,710	6.57
Total or average	XX	12,900	76,700	5.95	XX	12,300	68,100	5.55

XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Withheld to avoid disclosing company proprietary data.

TABLE 3
WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	126	$798	$3.96
Filter stone	172	982	5.71
Other coarse aggregate	78	475	6.09
Coarse aggregate, graded:			
Concrete aggregate, coarse	648	4,020	6.21
Bituminous aggregate, coarse	417	2,610	6.25
Bituminous surface-treatment aggregate	378	2,190	5.79
Railroad ballast	12	58	4.83
Other graded coarse aggregate	41	288	7.02
Fine aggregate (-3/8 inch):			
Stone sand, concrete	130	881	6.78
Stone sand, bituminous mix or seal	378	2,180	5.78
Screening, undesignated	49	286	5.84
Other fine aggregate	3	12	4.00
Coarse and fine aggregates:			
Graded road base or subbase	402	2,120	5.27
Unpaved road surfacing	127	712	5.61
Terrazzo and exposed aggregate	W	W	4.49
Crusher run or fill or waste	615	2,990	4.86
Other coarse and fine aggregates	418	2,570	6.14
Other construction materials	6	21	3.50
Agricultural limestone	(3/)	(3/)	9.18
Chemical and metallurgical: Cement manufacture	(3/)	(3/)	3.31
Special: Mine dusting or acid water treatment	(3/)	(3/)	23.63
Other miscellaneous uses:			
Abrasives	W	W	6.50
Waste material	W	W	3.84
Other specified uses not listed	15	76	5.07
Unspecified: 4/			
Actual	5,450	30,700	5.64
Estimated	1,570	8,490	5.41
Total or average	12,300	68,100	5.55

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals

2/ Includes limestone and sandstone; dolomite withheld from "Total" to avoid disclosing company proprietary data.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
WEST VIRGINIA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	W	W	34	181	W	W
Coarse aggregate, graded 4/	259	1,410	301	2,300	936	5,450
Fine aggregate (-3/8 inch) 5/	171	947	37	239	351	2,180
Coarse and fine aggregate 6/	409	2,280	330	1,620	822	4,490
Other construction materials	--	--	W	W	W	W
Agricultural 7/	--	--	W	W	W	W
Chemical and metallurgical 8/	--	--	W	W	--	--
Special 9/	W	W	W	W	--	--
Other miscellaneous uses 10/	W	W	W	W	W	W
Unspecified: 11/						
Actual	3,010	17,100	1,460	8,420	973	5,170
Estimated	976	5,280	100	551	494	2,670
Total	5,010	29,400	3,460	17,300	3,810	21,400

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Dolomite withheld from "Total" to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregate.

7/ Includes agricultural limestone.

8/ Includes cement manufacture.

9/ Includes mine dusting or acid water treatment.

10/ Includes abrasives, waste material, and other specified uses not listed.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
WEST VIRGINIA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	W	W	$7.40
Fill	W	W	3.00
Other miscellaneous uses	38	$209	5.50
Unspecified: 3/			
Actual	1,610	7,840	4.87
Estimated	W	W	4.89
Total or average	1,650	8,050	4.89

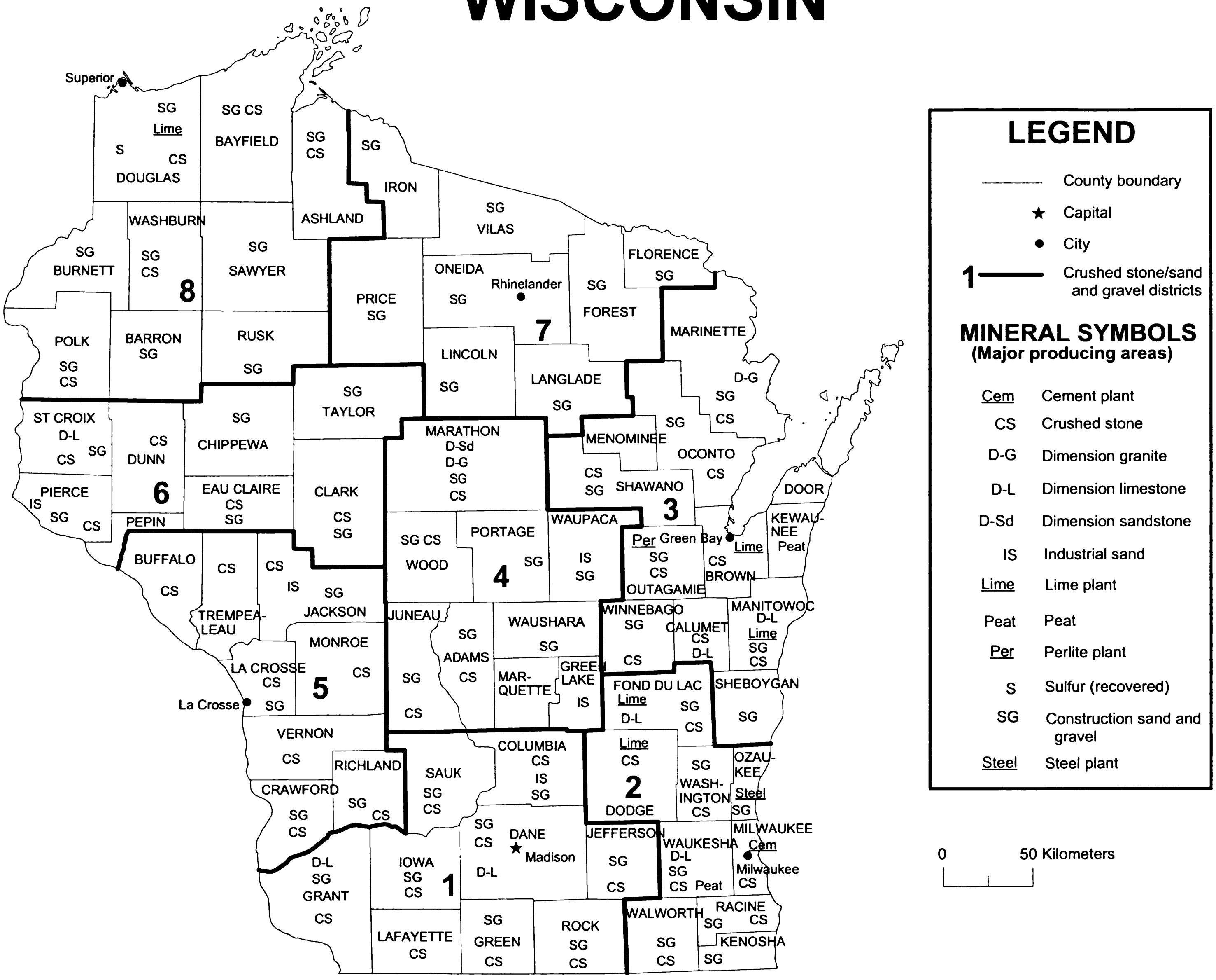
W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ To avoid disclosing company proprietary data, no district tables were produced for 1998.

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Reported and estimated production without a breakdown by end use.

WISCONSIN



Source: Wisconsin Geological and Natural History Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF WISCONSIN

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wisconsin Geological and Natural History Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value[1] of nonfuel mineral production for Wisconsin was $334 million, according to the U.S. Geological Survey (USGS). This was an increase of 3% from that of 1998,[2] and followed a 9.8% decrease in 1998 from that of 1997.

Crushed stone and construction sand and gravel were, by value, Wisconsin's leading nonfuel minerals in 1999, and accounted for 40% and 36%, respectively, of the State's total nonfuel mineral value. In 1999, these two mineral commodities accounted for nearly all of Wisconsin's increase in value; dimension stone, silica stone, and gemstones increased slightly, in descending order of change. Only two minerals showed value decreases (table 1). In 1998, crushed stone and construction sand and gravel also increased in value but were outweighed by decreases in other minerals. The most significant portion of the State's decrease in value from 1997 to 1998 resulted from the cessation of copper, gold, and silver production following the 1997 closing of the Flambeau Mine, Rusk County. Dimension stone also decreased in value in 1998 (table 1).

Based upon USGS estimates of the quantities of minerals produced in the 50 States for 1999, Wisconsin was 2d of 2 States that produced silica stone; remained 4th in dimension stone, 5th in industrial sand and gravel, and 10th in construction sand and gravel; and was a significant producer of crushed stone and lime.

The following narrative information was provided by the Wisconsin Geological and Natural History Survey (WGNHS).[3] Nicolet Minerals Co. completed the development of its Environmental Impact Report (EIR) for its proposed Nicolet Mine, a large, underground mining project for the development of the 50-million-metric-ton zinc-copper massive-sulfide ore body known as the Crandon deposit. The EIR described, in detail, the nature of the mining proposal, the physical setting of the proposed mining site, and the projected socioeconomic impacts of the project. The EIR and the various permit applications and license approvals were the focus of regulatory review by the Wisconsin Department of Natural Resources (WDNR) in 1999. The last element of the proposed project remaining to be resolved in the review is the computer modeling of the projected impact of the proposed mine on ground water resources in the immediate Crandon area. The EIR review should be completed during summer 2000 and a draft environmental impact statement that will be prepared by the WDNR may be ready for public review and comment by the end of that year (Alberts, 2000; Skillings Mining Review, 2000).

In 1999, metallic mineral exploration in Wisconsin essentially stopped; no exploratory drill holes were initiated or completed in Wisconsin for the first time in more than 30 years. In addition, no substantive mineral leasing activity appears to have taken place. According to conversations with representatives of the Wisconsin mineral industry, the decline in exploration and leasing can be attributed to industry concern with the ongoing review of the Nicolet Mine project and the length of time involved in permitting review under Wisconsin's mining regulations.

Legislative activity in 1999 centered on several proposed statutory changes and the review of proposed administrative rules. Proposed legislation in 1999 included bills to prohibit the granting of exemptions under administrative rules pertaining to metallic mining, prospecting, and disposal of mining solid waste, to expand the information requirements under the State's "bad actor" law (two separate proposals), to prohibit any discharge into the Wisconsin River from a metal mining operation, and to prohibit metal mining on State land. None of these proposals were adopted; several had been introduced in previous legislative sessions.

Two packages of administrative rules prepared by the WDNR were the subject of review in 1999 by the Legislature. This review included proposed rules that would require the development of a long-term irrevocable trust agreement for any metal mining operation in the State and a petition requesting the WDNR to enter into formal rule making for the so-called mining moratorium law. The proposed irrevocable trust agreement rules define a new requirement under Wisconsin law that a mining applicant must establish an irrevocable trust account to provide adequate financial guarantees to address unforeseen environmental damages related to the mining operation. This additional financial requirement goes beyond existing bonding and other payments and liability requirements to create a mechanism for funding possible mining-related damages that were not already covered under existing regulations. The final administrative rule was under legislative review and was expected to be approved in 2000. A petition submitted by several Wisconsin legislators to the WDNR Natural Resources Board in 1999 requested that rules be developed to clarify the WDNR's interpretation of the State's controversial "moratorium" law, which had been enacted by the Legislature in 1998. In early 1999, Nicolet Minerals Co. submitted information that addressed the requirement of a newly adopted Wisconsin statute to identify mine sites in rock materials capable of producing acid mine drainage where mines have operated for at least 10 years and mines that have been closed for a minimum of 10 years without causing significant environmental pollution. Nicolet Minerals submitted information on three mines purporting to address the operational requirement (McLaughlin Mine near San Francisco, CA), the closure requirement (Cullaton Lake Mine in Nunavit Territory in Canada), and both of the operational and closure requirements (Sacaton Mine near Casa Grande, AZ). As of the end of 1999, the WDNR had declined to prepare administrative rules by citing the clear language of the statute, the extensive legislative debate on the law, and the Legislature's decision at the time the law was prepared to not require the development of such rules.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel and crushed stone, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Thomas J. Evans, Geologist, authored the text of mineral industry information submitted by the WGNHS.

The Flambeau Mine near Ladysmith, WI, continued its reclamation program following the cessation of mining of high-grade copper-gold ore in 1997. The 13-hectare open pit mine had been filled and the site reshaped and revegetated. The development of restored wetlands, hiking trails for recreational access, and other aspects of the reclamation plan were in the second full year of development at the end of 1999.

References Cited

Alberts, Dale, 2000, Enlibra—In practice—Developing mining practices in compliance with Native American standards: Skillings Mining Review, v. 89, no. 42, October 14, p. 4-6.

Skillings Mining Review, 2000, Crandon, WI zinc-copper project improved by public involvement: Skillings Mining Review, v. 89, no. 10, March 4, p. 6.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WISCONSIN 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1997 Quantity	1997 Value	1998 Quantity	1998 Value	1999 p/ Quantity	1999 p/ Value
Gemstones	NA	5	NA	5	NA	6
Lime	597	35,100	582	35,400	580	35,200
Peat	5	256	W	W	W	W
Sand and gravel:						
Construction	33,500	110,000	34,700	116,000	34,900	119,000
Industrial	1,710	33,800	1,750	34,500	1,750	34,300
Stone:						
Crushed	28,700	120,000	31,200	127,000	32,200	135,000
Dimension metric tons	100,000	13,100	77,100	10,800	73,000	11,000
Combined values of other industrial minerals	XX	46,600	XX	(3/)	XX	(3/)
Total	XX	358,000	XX	323,000 4/	XX	334,000 4/

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Value excluded to avoid disclosing company proprietary data.

4/ Partial total, excludes values of copper (1997), gold (1997), silica stone 5/ (1997-98), silver (1997), and values indicated by symbol W that must be concealed to avoid disclosing company proprietary data.

5/ Includes grindstone, pulpstone, and sharpening stones; excludes mill liners and grinding pebbles.

TABLE 2
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone 2/	150 r/	20,600 r/	$89,900 r/	$4.37 r/	176	22,500	$94,100	$4.19
Dolomite	10	1,560	6,570	4.20	10	2,350	10,100	4.29
Granite	7	2,210	4,790	2.17	6	2,210	6,530	2.95
Sandstone and quartzite	4	2,070	9,300	4.50	4	2,340	9,040	3.87
Traprock	4 r/	2,300 r/	9,070 r/	3.94 r/	4	1,790	7,070	3.94
Total or average	XX	28,700	120,000	4.16	XX	31,200	127,000	4.07

r/ Revised. XX Not applicable.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	W	W	$5.09
Riprap and jetty stone	102	$643	6.30
Filter stone	169	850	5.03
Other coarse aggregate	973	4,300	4.42
Coarse aggregate, graded:			
Concrete aggregate, coarse	1,450	6,740	4.66
Bituminous aggregate, coarse	525	2,450	4.67
Bituminous surface-treatment aggregate	219	1,020	4.67
Railroad ballast	W	W	4.34
Other graded coarse aggregate	377	1,580	4.20
Fine aggregate (-3/8 inch):			
Stone sand, concrete	W	W	5.82
Stone sand, bituminous mix or seal	W	W	3.52
Screening, undesignated	619	2,560	4.13
Other fine aggregate	71	390	5.49
Coarse and fine aggregates:			
Graded road base or subbase	7,150	29,300	4.09
Unpaved road surfacing	1,090	2,930	2.70
Terrazzo and exposed aggregate	W	W	3.87
Crusher run or fill or waste	595	2,350	3.95
Other coarse and fine aggregates	944	3,910	4.14
Other construction materials	81	300	3.70
Agricultural limestone	378	3,150	8.34
Chemical and metallurgical:			
Cement manufacture	W	W	1.90
Lime manufacture	W	W	4.21
Other chemical and metallurgical	232	962	4.15
Special: Roofing granules	(3/)	(3/)	3.31
Other miscellaneous uses: Refractory stone (including ganister)	(3/)	(3/)	3.58
Unspecified: 4/			
Actual	7,430	29,200	3.93
Estimated	8,450	33,200	3.93
Total or average	31,200	127,000	4.07

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, quartzite, sandstone, and traprock.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
WISCONSIN: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

	District 1		District 2		District 3		District 4	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	187	767	W	W	161	724	W	W
Coarse aggregate, graded 4/	898	3,580	W	W	504	2,240	16	144
Fine aggregate (-3/8 inch) 5/	151	692	W	W	339	1,430	W	W
Coarse and fine aggregate 6/	2,900	11,000	2,280	9,370	2,460	9,980	1,300	4,020
Other construction materials	3	19	1,850	9,090	77	276	9	77
Agricultural 7/	127	730	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 9/	(8/)	(8/)	--	--	(8/)	(8/)	--	--
Special 10/	--	--	--	--	(8/)	(8/)	--	--
Other miscellaneous uses 11/	--	--	--	--	(8/)	(8/)	--	--
Unspecified: 12/								
Actual	(8/)	(8/)	(8/)	(8/)	--	--	2,450	9,160
Estimated	1,880	7,210	1,980	7,520	3,010	12,000	189	728
Total	6,870	26,400	6,270	27,700	6,800	27,700	3,960	14,100

	District 5		District 6		District 8		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	--	--	13	65	--	--
Coarse aggregate, graded 4/	268	1,180	--	--	W	W	(8/)	(8/)
Fine aggregate (-3/8 inch) 5/	17	56	--	--	--	--	--	--
Coarse and fine aggregate 6/	W	W	38	191	W	W	(8/)	(8/)
Other construction materials	411	2,090	--	--	204	745	--	--
Agricultural 7/	36	266	(8/)	(8/)	32	140	--	--
Chemical and metallurgical 9/	--	--	--	--	--	--	--	--
Special 10/	--	--	--	--	--	--	--	--
Other miscellaneous uses 11/	--	--	--	--	--	--	--	--
Unspecified: 12/								
Actual	3,260	13,500	(8/)	(8/)	--	--	--	--
Estimated	46	179	83	316	1,270	5,250	--	--
Total	4,040	17,300	1,130	4,840	1,520	6,200	579	2,570

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ No production reported in District 7.

3/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other graded coarse aggregate.

7/ Includes agricultural limestone.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture and lime manufacture.

10/ Includes roofing granules.

11/ Includes refractory stone (including ganister).

12/ Reported and estimated production without a breakdown by end use.

TABLE 5
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate	6,420	$24,500	$3.82
Plaster and gunite sands	43	292	6.79
Concrete products (blocks, bricks, pipe, decorative, etc.)	434	1,820	4.20
Asphaltic concrete aggregates and other bituminous mixtures	1,910	7,230	3.78
Road base and coverings 2/	6,880	22,100	3.21
Fill	1,620	4,080	2.52
Snow and ice control	128	413	3.23
Other miscellaneous uses 3/	238	1,340	5.64
Unspecified: 4/			
Actual	8,580	29,600	3.45
Estimated	8,470	24,200	2.85
Total or average	34,700	116,000	3.33

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement and lime).

3/ Includes filtration, railroad ballast, and roofing granules.

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
WISCONSIN: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	1,500	6,100	3,020	11,200	1,170	4,050
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	352	1,470	W	W
Asphaltic concrete aggregates and other bituminous mixtures	W	W	477	1,680	244	616
Road base and coverings 3/	29	126	2,680	10,200	975	2,540
Fill	125	380	851	2,500	292	518
Snow and ice control	W	W	17	87	5	17
Other miscellaneous uses 4/	W	W	W	W	16	56
Unspecified: 5/						
Actual	1,170	4,060	5,310	18,300	--	--
Estimated	2,440	6,560	2,440	6,560	1,700	3,870
Total	4,510	17,500	14,800	50,600	4,400	11,600

	District 4		District 5		District 6	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	272	1,440	W	W	344	1,620
Concrete products (blocks, bricks, pipe, decorative, etc.)	W	W	--	--	W	W
Asphaltic concrete aggregates and other bituminous mixtures	131	1,530	--	--	158	509
Road base and coverings 3/	208	571	--	--	198	3,740
Fill	187	447	1	2	30	43
Snow and ice control	W	W	13	24	58	119
Other miscellaneous uses 4/	W	W	--	--	--	--
Unspecified: 5/						
Actual	494	1,250	W	W	W	W
Estimated	422	1,410	30	95	901	2,770
Total	1,720	6,660	247	944	2,760	8,900

	District 7		District 8		Unspecified districts 6/	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate 2/	W	W	305	911	W	W
Concrete products (blocks, bricks, pipe, decorative, etc.)	--	--	W	W	--	--
Asphaltic concrete aggregates and other bituminous mixtures	38	108	509	1,270	W	W
Road base and coverings 3/	164	402	1,480	3,870	151	654
Fill	56	67	76	121	--	--
Snow and ice control	W	W	8	53	--	--
Other miscellaneous uses 4/	--	--	W	W	--	--
Unspecified: 5/						
Actual	--	--	84	526	1,300	4,840
Estimated	863	2,450	897	2,360	--	--
Total	1,230	3,450	3,380	9,230	1,670	6,540

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

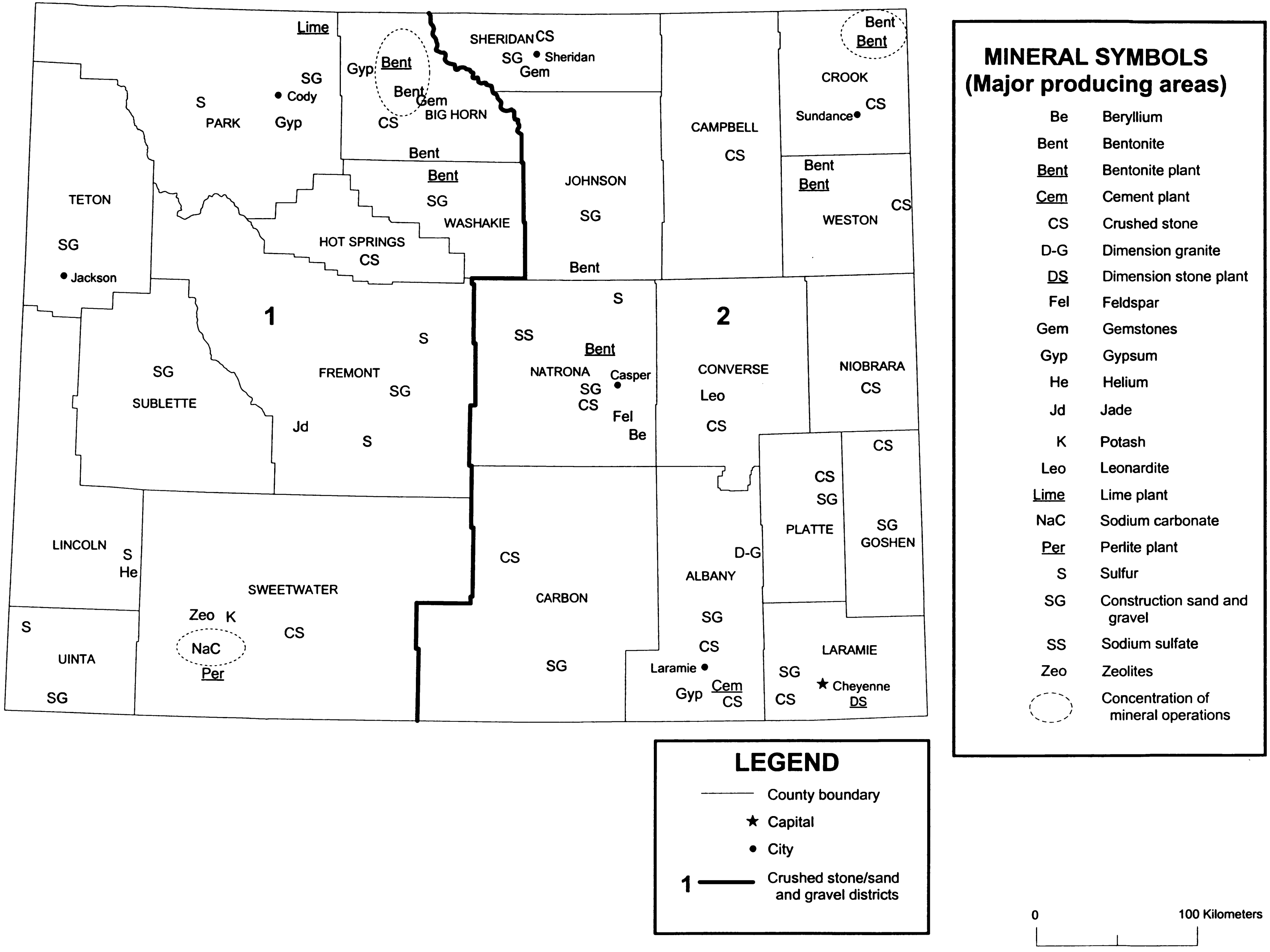
3/ Includes road and other stabilization (cement and lime).

4/ Includes filtration, railroad ballast, and roofing granules.

5/ Reported and estimated production without a breakdown by end use.

6/ Includes production within the State with no district reported.

WYOMING



MINERAL SYMBOLS (Major producing areas)

Be	Beryllium
Bent	Bentonite
Bent	Bentonite plant
Cem	Cement plant
CS	Crushed stone
D-G	Dimension granite
DS	Dimension stone plant
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
He	Helium
Jd	Jade
K	Potash
Leo	Leonardite
Lime	Lime plant
NaC	Sodium carbonate
Per	Perlite plant
S	Sulfur
SG	Construction sand and gravel
SS	Sodium sulfate
Zeo	Zeolites
◌	Concentration of mineral operations

Source: Wyoming State Geological Survey/U.S. Geological Survey (1999)

THE MINERAL INDUSTRY OF WYOMING

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Wyoming State Geological Survey for collecting information on all nonfuel minerals.

In 1999 the preliminary estimated value[1] of nonfuel mineral production for Wyoming was $956 million, according to the U.S. Geological Survey (USGS). This was about an 11% decrease from that of 1998,[2] and followed a 4.5% decrease from 1997 to 1998. The State ranked 16th (12th in 1998) among the 50 States in total nonfuel mineral production value, of which Wyoming accounted for about 2.5% of the U.S. total.

Wyoming's leading nonfuel mineral, by value, was soda ash, followed by bentonite, Grade-A helium, and portland cement. In 1999, decreases in the values of soda ash, bentonite, and construction sand and gravel accounted for nearly all lowered mineral values for the year; gemstones had a very small decrease. (Listings based on value are by descending order of change.) All other mineral commodities increased in value, led by increases in crushed stone, Grade-A helium, and portland cement. In 1998, a decrease in the value of soda ash and bentonite accounted for most the State's decrease in value; common clay increased slightly. All other minerals, led by construction sand and gravel, portland cement, lime, and crushed stone, increased in value.

Based upon USGS estimates of the quantities of minerals produced in the 50 States during 1999, Wyoming remained first in soda ash and bentonite and second in Grade-A helium. Soda ash (sodium carbonate) is an inorganic chemical extensively used in the manufacture of glass, paper, soap and detergents, and textiles, and as sodium bicarbonate in food products. The United States is the world's largest producer of soda ash. Wyoming, one of only two producing States, is home to the world's largest known natural deposit of trona. Trona is the principal ore from which soda ash is produced. California produces a significantly smaller quantity of natural soda ash. In the past several years Wyoming has had considerable exploration activity for metals but has not had significant metal production since iron ore mining ceased in April 1984.

The Wyoming State Geological Survey (WSGS) provided the following narrative information.[3] Georgia Marble Co., which produces white marble aggregate from its Wheatland, WY, quarry and plant, changed the name of its operations to Imerys Marble, Inc. The company continues to produce a range of sizes, including fines for pigment, at its Wyoming operations. Guernsey Stone, Inc. and at least four other operators in Wyoming produce small amounts of decorative aggregate. In addition, several operators shipped landscape rock (boulders, fieldstone, and moss rock) in 1999 to markets mostly in the Colorado Front Range but also to California and Illinois.

Pete Lien and Sons, Inc., which supplies emissions control limestone to the Missouri Basin Power Project's coal-fired electricity generating plant north of Wheatland, began production of limestone used in the refining of sugar beets at its Hartville quarry in 1999. Exploration for additional chemical grade and aggregate quality limestone resources continued, especially near the limestone and aggregate poor Powder River Basin.

Railroad ballast is an important construction material produced at Meridian Aggregate Co.'s Granite Canyon quarry west of Cheyenne, by Neosho Construction Co., Inc. at the Bald Butte quarry in Niobrara County and by Guernsey Stone, Inc. at Guernsey. The Bald Butte quarry was reactivated in 1999 to provide materials for the upgrading of the Union Pacific Railroad line between Lusk, WY, and Morrill, NE.

Soda ash and other sodium compound production from mined trona was less in 1999 than in the record year of 1997. This decline was due mainly to smaller orders for soda ash from the Far East.

Bentonite production continued at near record levels in 1999. Expanding markets for most uses of bentonite contributed to this increase, especially the growing market for kitty litter.

Addwest Minerals Inc. continued to test market zeolite mined in Wyoming. In 1999, two additional companies were exploring for zeolite minerals in the Beaver Divide area of central Wyoming and the Tatman Mountain area in the central Bighorn Basin.

The WSGS has upgraded and added information about various industrial minerals to its website. The URL for this information is http://www.wsgsweb.uwyo.edu/minerals/about.htm.

Exploration and expansion continued for dimensional stone resources in Wyoming. Raven Quarries Llc., which produces a pink swirled granite called Mirage, ceased production of its black granite, called Wyoming Raven, until additional orders are received. Raven Quarries ships most of its quarried blocks to Western Granite Co. Ltd. in Tijuana, Mexico, for processing.

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[1] The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys–mineral commodity, State, and country–also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals; facsimile copies may be obtained from MINES FaxBack.

[2] Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

[3] Ray E. Harris, Staff Geologist-Industrial Minerals and Uranium, and W. Daniel Hausel, Senior Economic Geologist-Metals and Precious Stones, both of the Wyoming State Geological Survey, coauthored the text of mineral industry information submitted by the agency.

At yearend, one Italian company was obtaining permits to quarry a dimensional limestone near Laramie. Mediterranean Indian Atlantic Stone of Wyoming (MIAS-WY) established an office in Cheyenne. By yearend, MIAS-WY had acquired property and exploration permits for granite, marble, and limestone quarry sites and was negotiating for land in or near Laramie for the construction of a small fabricating plant. Strid Marble and Granite Co., in Cheyenne, constructed a custom stone fabricating plant capable of processing 27 metric tons per day (t/d) of rock into slab and polishing 54 t/d of slab. Raven Quarries has shipped some Mirage granite to Strid Marble and Granite for processing.

During 1999, the WSGS completed a map of the Barlow Gap quadrangle south of the Rattlesnake Hills in the northern Granite Mountains of central Wyoming. The map was completed under a State map contract with the USGS. This region has considerable potential for the discovery of gold mineralization and gemstones.

Research by the WSGS identified several new gemstone localities in the State during the past few years. Some of the better gemstones in Wyoming include corundum, diamond, garnet, iolite, jade, and peridot. These and many other gems are the discussion of a new publication by the WSGS "Gemstones and other unique minerals and rocks of Wyoming—A field guide for collectors," WSGS Bulletin 71, which was scheduled to be published in the summer of 2000.

Some gemstones from the Red Dwarf ruby deposit near Jeffrey City in the southern Granite Mountains were cut into spectacular gems by a consultant from Casper. These gemstones weighed several carats.

A 700,000-hectare area covering portions of the Laramie and Medicine Bow Mountains, and the Sierra Madre was investigated for mineral occurrences, prospects, and historic mines by the WSGS. The project was funded by the USGS.

Work completed on the Medicine Bow National Forest showed this Forest in southeastern Wyoming to have potential for the occurrence of diamond and base and precious metal resources in both visible and blind ore deposits (Sutherland, W.M., and Hausel, W.D., Wyoming State Geological Survey, December 9, 1999, 1999 Mineral Resource Survey of the Medicine Bow National Forest, accessed February 7, 2001, at URL http://www.wsgsweb.uwyo.edu/metals/Mineral_survey_medbow/survey_med_bow.htm). Many mines and anomalies were identified during the project. The entire Medicine Bow National Forest is identified as having high to moderate potential for occurrence of diamondiferous kimberlite. This is based on favorable geology, the discovery of kimberlitic indicator (pathfinder) minerals in some samples, and the presence of the two largest kimberlite districts in the United States within 16 and 32 kilometers of the Forest boundary.

South of a major shear zone, in the southern portion of the Medicine Bow Mountains and the Sierra Madre, ancient volcanic rocks provide excellent hosts for massive sulfide mineralization (containing copper, gold, lead, silver, and zinc) of magmatic origin, with some shear zone copper, gold, and associated gold placers. Many gold and copper deposits, prospects, and historic mines lie along the shear zone. Chromium, copper, gold, silver, palladium, platinum, titanium, and vanadium were identified at a few localities in the Forest.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN WYOMING 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

	1997		1998		1999 p/	
Mineral	Quantity	Value	Quantity	Value	Quantity	Value
Clays:						
Bentonite	3,340	140,000	3,150	145,000	3,160	137,000
Common	W	W	W	W	W	W
Gemstones	NA	11	NA	14	NA	13
Sand and gravel: Construction	3,090	12,300	4,770	18,100	3,690	14,300
Stone: Crushed	5,010	30,700	5,580	31,600	6,200	36,000
Zeolites metric tons	(3/)	NA	(3/)	NA	NA	NA
Combined values of cement (portland), gypsum (crude), helium (Grade-A), lime, soda ash, and values indicated by symbol W	XX	938,000	XX	879,000	XX	769,000
Total	XX	1,120,000	XX	1,070,000	XX	956,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Withheld to avoid disclosing company proprietary data.

TABLE 2
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS, BY KIND 1/

Kind	1997 Number of quarries	1997 Quantity (thousand metric tons)	1997 Value (thousands)	1997 Unit value	1998 Number of quarries	1998 Quantity (thousand metric tons)	1998 Value (thousands)	1998 Unit value
Limestone	4 r/	725 r/	$2,920 r/	$4.03 r/	7	643	$2,960	$4.60
Dolomite	1	W	W	4.89	1	W	W	4.66
Granite	2	W	W	6.30	2	W	W	5.99
Marble	1	104	3,280	31.53	1	W	W	6.09
Quartzite	4	W	W	11.91	1	W	W	12.16
Traprock	5	W	W	3.97	--	--	--	--
Volcanic cinder and scoria	1	W	W	6.17	1	W	W	6.22
Miscellaneous stone	1	97	577	5.95	4	332	1,290	3.89
Total or average	XX	5,010	30,700	6.13	XX	5,580	31,600	5.66

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

TABLE 3
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	W	W	$8.71
Other coarse aggregate	36	$292	8.11
Coarse aggregate, graded:			
Concrete aggregate, coarse	144	820	5.70
Bituminous aggregate, coarse	W	W	6.14
Railroad ballast	W	W	4.08
Other graded coarse aggregate	319	1,920	6.01
Fine aggregate (-3/8 inch):			
Stone sand, concrete	11	37	3.36
Stone sand, bituminous mix or seal	W	W	3.31
Screening, undesignated	W	W	3.30
Other fine aggregate	504	1,670	3.30
Coarse and fine aggregates:			
Graded road base or subbase	19	63	3.32
Other coarse and fine aggregates	157	1,820	11.59
Chemical and metallurgical: Cement manufacture	(3/)	(3/)	4.07
Unspecified: 4/			
Actual	3,550	21,500	6.05
Estimated	(3/)	(3/)	6.00
Total or average	5,580	31,600	5.66

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, marble, miscellaneous stone, quartzite, traprock, and volcanic cinder and scoria.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Reported and estimated production without a breakdown by end use.

TABLE 4
WYOMING: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	W	W	W	W	--	--
Coarse aggregate, graded 3/	--	--	462	2,740	--	--
Fine aggregate (-3/8 inch) 4/	--	--	514	1,700	--	--
Coarse and fine aggregate 5/	W	W	W	W	--	--
Other construction materials	154	1,820	59	359	--	--
Chemical and metallurgical 6/	--	--	(7/)	(7/)	--	--
Unspecified: 8/						
Actual	--	--	3,470	21,000	86	473
Estimated	--	--	(7/)	(7/)	--	--
Total	154	1,820	5,340	29,300	86	473

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes riprap and jetty stone and other coarse aggregate.

3/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), railroad ballast, and other graded coarse aggregate.

4/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

5/ Includes graded road base or subbase and other coarse and fine aggregates.

6/ Includes cement manufacture.

7/ Withheld to avoid disclosing company proprietary data; included in "Total."

8/ Reported and estimated production without a breakdown by end use.

TABLE 5
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate 2/	467	$2,030	$4.34
Concrete products (blocks, bricks, pipe, decorative, etc.)	18	89	4.94
Asphaltic concrete aggregates and other bituminous mixtures	354	3,020	8.52
Road base and coverings 3/	1,110	3,960	3.58
Fill	61	113	1.85
Snow and ice control	34	125	3.68
Other miscellaneous uses	57	255	4.47
Unspecified: 4/			
Actual	1,980	4,500	2.27
Estimated	690	4,030	5.84
Total or average	4,770	18,100	3.80

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Reported and estimated production without a breakdown by end use.

TABLE 6
WYOMING: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts 2/	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 3/	196	1,130	290	983	--	--
Aspaltic concrete aggregates and other bituminous mixtures	W	W	W	W	--	--
Road base and coverings 4/	763	3,060	342	906	--	--
Fill	18	41	43	72	--	--
Other miscellaneous uses 5/	W	W	W	W	--	--
Unspecified 6/	658	3,180	483	2,820	1,530	2,530
Total	1,960	10,300	1,270	5,280	1,530	2,530

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes production within the State with no district reported.

3/ Includes plaster and gunite sands.

4/ Includes road and other stabilization (cement and lime).

5/ Includes snow and ice control.

6/ Reported and estimated production without a breakdown by end use.

MAPS AND MINERAL SYMBOLS

The maps in this report are intended to show by mineral symbol the location of significant nonfuel mineral mining or processing operations within each State in 1999. They are not intended to show the location of every mine, quarry, and operation. Because there are about 13,000 nonfuel mineral operations in the United States, publication space limitations preclude the inclusion of a clear and legible map indicating all active operations. The U.S. Geological Survey's National Atlas, however, provides such data on the Internet at URL <http://www.nationalatlas.gov>.

In most cases, a mineral symbol represents production of a significant quantity of a mineral. A symbol can indicate the location of a major mineral mining or processing operation, the location of a concentration of mining operations for a specific mineral, or the location of significant operations within a county. In some cases, however, a symbol may indicate a small operation that is significant because the mineral is uncommon or unique within the State or the country. Where there is an extensive geographic area with a significant concentration of similar operations, a dashed line defines the area.

A key for the mineral symbols used on the maps follows.

Abr	Abrasives
Ag	Silver
AgLime	Agricultural lime
Al	Aluminum plant
Ala	Alumina
Asb	Asbestos
Au	Gold
B	Borates
Ba	Barite
BC	Ball clay
Be	Beryllium
Bent	Bentonite
Br	Bromine
Bruce	Brucite
Bx	Bauxite
CaC	Calcium carbonate
Cd	Cadmium
Cem	Cement plant
CFA	Chrome ferroalloy plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
D-D	Dimension dolomite
D-G	Dimension granite
D-L	Dimension limestone
D-M	Dimension marble
D-Q	Dimension quartzite
D-Sd	Dimension sandstone
D-Sl	Dimension slate
D-Sp	Dimension soapstone
Dia	Diatomite
D̊S	Dimension stone
Em	Emery
F	Fluorspar
FA	Ferroalloys plant
FC	Fire clay
Fe	Iron
Fel	Feldspar
FePig	Iron oxide pigments
Fs	Ferrosilicon
Ful	Fuller's earth
Gar	Garnet
Ge	Germanium
Gem	Gemstones
Gil	Gilsonite
Gr	Graphite plant
GS	Greensand
Gyp	Gypsum
He	Helium
Hg	Mercury plant
IS	Industrial sand
ISG	Industrial sand and gravel
Jd	Jade
K	Potash
Ka	Kaolin
Ky	Kyanite
Leo	Leonardite
Li	Lithium carbonate
Li	Lithium plant
Lime	Lime plant
Mg	Magnesium
MgCd	Magnesium compounds
Mica	Mica
Mn	Manganese dioxide plant
Mo	Molybdenum
Mul	Synthetic mullite plant
Nabic	Sodium bicarbonate
NaC	Sodium carbonate
Nb	Columbium
Nb/Ta	Columbium and tantalum plant
Ni	Nickel
Nsal	Natural salines (CaCl)
O	Olivine
Opal	Precious opal
P	Phosphate rock
Pb	Lead
Peat	Peat
Per	Perlite
Pt-Pd	Platinum/palladium
Pum	Pumice and pumicite
Pyrp	Pyrophyllite
QC	Quartz crystal
RE	Rare earths
S	Sulfur
SaCd	Saline compound
Salt	Salt

Sb	Antimony
SG	Construction sand and gravel
Sh	Shale
Shell	Shell
Si	Silicon metal plant
Slag	Slag
SS	Sodium sulfate
Steel	Steel plant
Talc	Talc
Ti	Titanium minerals
TiMet	Titanium metal plant
TiPig	Titanium dioxide pigment plant
V	Vanadium
Vm	Vermiculite
W	Tungsten
Wol	Wollastonite
Zeo	Zeolites
Zn	Zinc
Zr	Zirconium plant
Zr	Zirconium

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